



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Livsmedelsteknik I - Värmelära

Food Technology I - Heat and Heat Transfer

YTHA30, 7,5 credits, G1 (First Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED LIV

Date of Decision: 2023-04-17

General Information

Main field: Food Science.

Compulsory for: KLMT1

Language of instruction: The course will be given in Swedish

Aim

The aims of the course are to provide students with a deeper understanding of how various heating and cooling processes work based on principles of heat transfer, and to provide insight with respect to how these processes affect food quality. In addition, the course aims to give students practical knowledge in how to carry out temperature measurements in a correct manner in food material and processing equipment.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- be able to explain different methods of measuring the temperature in food production, transport and storage
- be able to explain what happens to the energy content during heating and cooling
- be able to explain the concepts of heat transfer and heat transport in solid and liquid foods and be able to transfer this knowledge to different food handling processes and equipment
- be able to describe different methods and equipment for heating/cooling food.

Competences and skills

For a passing grade the student must

- be able to measure the temperature with different types of calibrated temperature measuring equipment and make an error estimate of the obtained value
- be able to calculate the change in energy content of food during heating and cooling,
- be able to calculate required power for cooling, freezing, and heating equipment.
- be able to use a Mollier diagram to determine the relative humidity of air, wet bulb temperature and dew point.

Contents

Almost all forms of food preparation involve heating in some manner. The opposite of heating is cooling, which also is a very important process in the manufacturing of food products. These processes often include phase changes such as freezing, thawing, evaporating/concentrating, and the melting of fats. In particular it is the phase changes of water that is interesting from an energy utilization perspective.

This course deals with processes in which heat is transferred to; or removed from food. The course considers the different conduct methods of heat transfer to the surfaces of food, how it is transported in the food itself, and how the quality of the food is affected as a result. The following heating and cooling processes will be presented and explained: boiling, roasting/frying, microwave heating, deep-frying, cooling, and freezing. The course will result in the student being able to calculate how much energy is converted/ transported during these processes in order to choose equipment of appropriate capacity.

Examination details

Grading scale: UG - (U,G) - (Fail, Pass)

Assessment: Written examination in heat transfer; (theoretical and numerical), laboratory exercises, assignment and project report.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Parts

Code: 0120. **Name:** Written Examination: Calculation.

Credits: 2. **Grading scale:** UG. **Assessment:** written exam

Code: 0220. **Name:** Laboratory Experiments.

Credits: 1. **Grading scale:** UG. **Assessment:** all laboratory experiments

Code: 0320. **Name:** Project Work.

Credits: 1,5. **Grading scale:** UG. **Assessment:** written report

Code: 0420. **Name:** Written Task.

Credits: 1. **Grading scale:** UG. **Assessment:** assignment

Code: 0520. **Name:** Written Examination: Theory.

Credits: 2. **Grading scale:** UG. **Assessment:** written exam

Admission

The number of participants is limited to: No

Reading list

- Books.
- Nylander, A et al.: Livsmedelsvetenskap. Studentlitteratur, 2014, ISBN: 978-91-44-

09567-7.

- Per Uno Ekholm, Lars Fraenkel, Sven Hörbeck : Formler & tabeller i fysik, matematik & kemi för gymnasieskolan. Konvergenta HB, 2013, ISBN: 9789197370882.
- Andreas Håkansson: Livsmedelstekniska perspektiv. 2015. Pdf from the author.

Contact and other information

Course coordinator: Ia Rosenlind, ia.rosenlind@food.lth.se

Course homepage: <https://www.ple.lth.se/en/>

Further information: Study visits and guest lectures are compulsory. In case of legal impediment the student has to accomplish an individual assignment with an equivalent content.