



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Livsmedelsteknik Food Engineering

KLGN20, 7,5 credits, A (Second Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED B/K

Date of Decision: 2023-04-18

General Information

Main field: Food Technology and Nutrition.

Compulsory for: MLIV1

Elective Compulsory for: MLSA1, MLSA2

Elective for: B4-lm, K5-p

Language of instruction: The course will be given in English

Aim

This purpose of the course is to give deeper understanding of fundamental engineering principles, with special emphasis on heat and mass transfer in food processing unit operations.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- Describe and discuss the processing of foods in terms of unit operations.
- Apply in-depth knowledge of transport phenomena and mass and energy balances to analyze and design food processes..
- Have knowledge of common unit-operation used in the food industry.

Competences and skills

For a passing grade the student must

- Be able to dimension food processing equipment using fundamental principles from transport phenomena.
- Be able to formulate mass and energy balances in the form of differential equations derived from transport phenomena taking place in the studied unit operations, and solve them using mathematical tools.
- Be able to use spreadsheet software for food engineering calculations.
- Be able to estimate and measure thermal-physical properties relevant to food engineering processes and equipment.
- Be able to calculate unsteady-state heat transfer in food products.
- Be able to perform thermal process calculations, taking into account microbial and quality parameters.
- Be able to calculate freezing rates in food products given food and freezer properties.
- Be able to calculate food dehydration rates using mass and energy balances in conjunction with psychrometrics.

Judgement and approach

For a passing grade the student must

- Have basic insight into how processing parameters influence food safety.
- Be able to critically evaluate and compare model based estimations to experimental data in food engineering applications.
- Be able to critically evaluate measurement uncertainty and predict how it propagates in food engineering calculations.

Contents

A) Food engineering fundamentals: Engineering numeracy, thermophysical properties and uncertainty propagation. B) Heat Transfer and Food: Review of fundamental heat transfer, estimation of heat transfer coefficients in food engineering applications, heat exchangers and unsteady state heat transfer. C) Kinetics and Food Preservation: Review of fundamental reaction kinetics, preservation technologies, thermal food process calculations and lethality. D) Freezing and Frozen Foods: Freezing mechanisms, equipment and freezing rates. E) Mass Transfer and Food Dehydration: Review of fundamental mass transfer and psychrometrics, convective and diffusive mass transfer in food processing, drying rates and drying equipment. Learning activities include lectures, seminars, problem-solving, computer exercises and practical experiments in pilot-scale.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)

Assessment: Assignments, laborative work and written exam. The TH-scale is based on the written exam.

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: 0119. **Name:** Written Examination.

Credits: 7,5. **Grading scale:** TH. **Contents:** Written exam

Code: 0219. **Name:** Laboratory Exercises.

Credits: 0. **Grading scale:** UG. **Assessment:** Reports **Further information:** The laboratory part of the course contains both "wet" laboratory experiments and computer tasks.

Admission

Assumed prior knowledge: KETF01 Transport processes

The number of participants is limited to: No

Reading list

- R. Paul Singh and Dennis R. Heldman : Introduction to Food Engineering - 5th Edition. Academic Press. , ISBN: 978-0-12-398530-9.
<http://www.sciencedirect.com/science/book/9780123985309>.
- Handouts.

Contact and other information

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