# .- Food Industry Processes and Plants

## Prof. Giorgia Spigno, Prof. Franco Dameno

COURSE AIMS AND INTENDED LEARNING OUTCOMES

 The course aims to provide students with knowledge in the technological area, in particular in relation to the use of application tools and analysis methods in food industry processes, so as to optimise production cycles in a global quality sense.

As the intended learning outcomes, at the end of the course, students will know: the method for calculating the lethality of a heat treatment as an application tool for controlling, forecasting and optimising processes; the process and product parameters that can be optimised in non-stationary heat treatments; and the principles underlying the development and industrial implementation of both conventional and non-conventional and innovative technologies, including the processes of sanitising processing lines, including with reference to an industrial approach for sustainable development.

Based on the knowledge acquired, students will be able to identify the key parameters for controlling and optimising heat processes, including through the choice of non-conventional technologies. Students will be able to formulate more sustainable hypotheses and scenarios of process development.

COURSE CONTENT

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|  | ECTS |
| Optimisation of conventional heat treatments |  |
| Calculation of treatment times and lethality for continuous and discontinuous processes. | 1.5 |
| Estimation and calculation of heat exchange coefficients and their use in a situation of thermal transfer in a non-stationary phase. | 1.5 |
| Unconventional treatments  |  |
| Overview of heating technologies (ohmic, microwave, radiofrequency, infrared heating) and heat-proof technologies (high pressure treatments, irradiation, ultrasound, pulsed electric fields). | 0.5 |
| Technical-economic elements for the sustainable development of Food Processes |  |
| Technical-economic elements for the design of new production lines, new production facilities and new products, as well as the management of existing processes, also in relation to sustainability aspects, through the presentation of case studies for specific food product categories: dry pasta and tomato derivatives. | 3.0 |
| Tutorials | 2.0 |
| The solving of problems related to the calculation and optimisation of conventional heat treatments. Seminars with company testimonials. Possible group work on process development and sustainability.  |  |

READING LIST

DR Heldman-RW Hartel, *Principles of Food Processing,* Int. Thomson Publishing, New York, 1997.

M. Karel, DB Lund, *Physical Principles of Food Preservation,* Marcel Dekker, Inc, New York, 2003.

FAR Oliveira, JC Oliveira, *Processing Foods. Quality Optimisation and Process Assessment,* CRC Press, New York, 1999.

H. Ramaswamy, M. Marcotte, *Food Processing. Principles and Applications,* Taylor & Francis Group, New York, 2006.

RP Singh, DR Heldman, *Introduction to Food Engineering. Fifth Edition*. Academic Press, Burlington, USA, 2014.

KJ Valentas-E. Rotstein-RP Singh, *Handbook of Food Engineering Practice,* CRC Press, New York, 1997.

Lecturer's notes.

Aids related to specific topics will be provided during the course.

TEACHING METHOD

1. Theoretical frontal and dialogue-based lectures aimed at presenting the key concepts of the subject.
2. Frontal tutorials with assisted resolution of numerical problems related to conventional heat treatments and technical-economic elements of product and process development.
3. Possible assignment of group work for the resolution of specific assignments related to the course topics.
4. Classroom seminars with company testimonials.
5. A possible educational outing to a food company.

ASSESSMENT METHOD AND CRITERIA

During the course intermediate assignments will be given on specific topics of the program, including numerical exercises, open-ended theoretical questions and teamwork on product / process development case-studies. The assignments will be evaluated and will contribute to the final mark together with a last session dedicated to an oral discussion of the presented reports. The final mark will reflect the acquired competences, the elaboration capacity, and the mastery of the appropriate technical terminology. In the case of working students or students unable to participate in the group works, this must be communicated to the lecturers at the beginning of the course, to define alternative exams modalities.

NOTES AND PREREQUISITES

The course would require a knowledge of transport phenomena and unit operations in the food industry. If required, the student can ask the teacher for supplementary material related to this topic.

Should the health situation relating to the Covid-19 pandemic not allow face-to-face teaching, remote teaching in synchronous or asynchronous mode will be guaranteed; this will be communicated in good time to students.

***OFFICE HOURS FOR STUDENTS***

Prof. Giorgia Spigno and Franco Dameno are available for the students after the lectures. In addition, they are available to receive students following specific appointment or through remote meetings. In any case, it is suggested to write an e-mail (giorgia.spigno@unicatt.it; francodameno@gmail.com) to agree on the day and time of reception.

Information on office hours available on the teacher's personal page at http://docenti.unicatt.it/.