# .- Food Technology and Plants

## Proff. Giorgia Spigno, Giulio FERRARI

***COURSE AIMS AND INTENDED LEARNING OUTCOMES***

 The overall aim of this course is 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 from a global quality point of view.

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, predicting and optimising processes; the process and product parameters that can be optimised in non-stationary heat treatments; the principles underlying the development and industrial implementation of unconventional and innovative technologies; the key elements of an industrial approach to sustainable development.

The students will be introduced to case studies of specific food products showing how new products and processes can be developed and scaled-up, existing products and processes can be improved and, how the production processes are managed in real industrial environments.

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 and for the management, control, innovation and direction of an industrial production plant.

***COURSE CONTENT***

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|  | ECTS |
| **Optimisation of conventional heat treatments**  |  |
| Calculation of treatment times and lethality for continuous and discontinuous processes.  | 2.0 |
| Estimation and calculation of heat transfer coefficients, and Unsteady-state heat transfer case studied in the food industry.  | 1.5 |
| **Unconventional treatments**  |  |
| Overview of thermal technologies (ohmic, microwave, radiofrequency, infrared heating) and non-thermal technologies (high pressure treatments, irradiation, ultrasound, pulsed electric fields, plasma) | 1.5 |
| **Management of industrial food production plants** |  |
| Technical-economic elements for the:* Control and management of production lines
* Development of a new processing line
* Evaluation and innovation of a current technology
* Development of a new product
* Direction of a production plant
 | 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/product development.  |  |

***READING LIST***

D.R. Heldman-R.W. Hartel, *Principles of Food Processing,* Int. Thomson Publishing, New York, 1997.

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

F.A.R. Oliveira, J.C. 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.

R.P. Singh, D.R. Heldman, *Introduction to Food Engineering. Fifth edition*. Academic Press, Burlington USA, 2014.

K.J. Valentas-E. Rotstein-R.P. 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 involving the assisted solving of numerical problems related to conventional heat treatments and technical-economic aspects of new product and process development.

3. Assignment of working groups for the resolution of specific case-studies related to the course topics (eventually).

4. Classroom seminars with company testimonials.

5. A possible educational visit 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 requires a knowledge of unit operations in the food industry.

***OFFICE HOURS FOR STUDENTS***

Prof. Giorgia Spigno and Giulio Ferrari are available for the students after the lectures held in Cremona. 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; giulio.ferrari@esselunga.it) to agree on the day and time of reception.