# .- Food Industry Processes and Plants

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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). | 1.0 |
| 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 and sanitation systems. Overview of the concepts and problems underlying sustainability in the food sector, so as to understand it and imagine solutions for increasing it. | 2.0 |
| 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

At the end of the course there will be a final written exam to assess the student's acquired skills, reasoning ability, analytical rigour and language command. Students will be given 2 hours to solve numerical exercises and answer open-ended theoretical questions. On average, students will be given 2 numerical problems relating to the calculation and optimisation of conventional heat treatments (maximum 16 marks) and two open-ended questions (maximum 16 marks). Open-ended questions may also be discussed orally. Should a student fail to solve a question, no mark will be assigned while incorrect answers or errors in the resolution of the exercises may result in penalties. At the beginning of the course, it will be indicated if group work will be carried out during the year, with an illustration of the topics and aims of the work, and the requirements of the final report (normally a PowerPoint presentation). In this case, the final mark will take into account both the written exam and the group work assessment. Normally, the group work consists of a literature search on specific course topics or the resolution of case studies. The working groups include a maximum of 5 students and it is necessary to indicate the contribution of the various members in the final report. The final report will be evaluated out of thirty. In the case of group work, the final mark will be calculated as the weighted arithmetic average of the final written mark (weight 2/3) and the evaluation of the group work (weight 1/3). In the case of students who are working or unable to participate in the group work, this must be communicated to the lecturer at the beginning of the course so that the lecturer can identify alternative activities to cover this part of the programme.

NOTES AND PREREQUISITES

The course requires a knowledge of unit operations in the food industry.

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.

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