**COURSE OUTLINE**

## 1. GENERAL

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|---|---|---|---|
| **SCHOOL** | FOOD AND NUTRITIONAL SCIENCES | | |
| **ACADEMIC UNIT** | FOOD SCIENCE AND HUMAN NUTRITION | | |
| **LEVEL OF STUDIES** | BACHELOR OF SCIENCE | | |
| **COURSE CODE** | **210** | **SEMESTER** | 3RD |
| **COURSE TITLE** | PRINCIPLES OF FOOD ENGINEERING | | |

| **INDEPENDENT TEACHING ACTIVITIES** *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits* | **WEEKLY TEACHING HOURS** | **CREDITS** |
|---|---|---|
| Lectures, laboratory and problem solving tutorials | 5 | 5 |
| | | |
| | | |
| *Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).* | | |

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|---|---|
| **COURSE TYPE** *general background, special background, specialised general knowledge, skills development* | Field of Science & Engineering |
| **PREREQUISITE COURSES:** | Mathematics, Physics, Basic Computing |
| **LANGUAGE OF INSTRUCTION and EXAMINATIONS:** | Greek |
| **IS THE COURSE OFFERED TO ERASMUS STUDENTS** | NO |
| **COURSE WEBSITE (URL)** | |

## 2. LEARNING OUTCOMES

**Learning outcomes**

*The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.*

*Consult Appendix A*

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The aim of the course is the students to acquire basic engineering knowledge and necessary skills in order to become able to calculate basic quantities necessary in food processing. Specifically, the students will acquire knowledge in momentum, heat and mass transfer, and the ability to recognize, understand, analyze and explain these phenomena which are often encountered in food processing in order to a) explain changes that are observed in food processing and b ) calculate the necessary parameters and variables in food processing.

Upon successful completion of this course the student will be able to:

• perform conversion of units
• make calculations using the steam tables
• acquire basic knowledge of the main physical properties of food
• conduct mass and energy balances

- calculate pump parameters and flow conditions of a liquid food and select the appropriate pump
- understand and distinguish the mechanisms of heat and mass transfer
- identify and calculate key quantities in heat and mass transfer e.g. heat and mass transfer coefficient, heat and mass transfer rate, thermal conductivity, diffusion coefficient, etc.
- distinguish the resistances to heat and mass transfer and calculate the flow rate of heat and mass in various applications e.g. insulation, heat exchangers, packaging etc.
- calculate the time needed to heat or to cool a product or to achieve certain mass transfer under certain initial and boundary conditions (local or average product temperature or concentration)
- compare heat and mass transfer phenomena and identify similarities and common physical laws that govern these phenomena

**General Competences**

*Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?*

| | |
|---|---|
| *Search for, analysis and synthesis of data and information, with the use of the necessary technology* | *Project planning and management* |
| *Adapting to new situations* | *Respect for difference and multiculturalism* |
| *Decision-making* | *Respect for the natural environment* |
| *Working independently* | *Showing social, professional and ethical responsibility and sensitivity to gender issues* |
| *Team work* | *Criticism and self-criticism* |
| *Working in an international environment* | *Production of free, creative and inductive thinking* |
| *Working in an interdisciplinary environment* | *……* |
| *Production of new research ideas* | *Others…* |
| | *…….* |

Analyze and synthesize data and information
Promote creative and induction thinking
Work autonomously
Work in teams

## 3. SYLLABUS

1. Introduction, specific heat, enthalpy, steam tables
2. Thermal conductivity, viscosity, water activity
3. Mass and energy balance
4. Mechanical energy equation. Momentum balance
5. Fluid flow, pumps
6. Flow around submerged bodies, flow in beds of solids
7. Heat transfer by conduction, and convection
8. Heat exchangers. Heat transfer by radiation
9. Heat transfer by conduction in non-steady state
10. Mass transfer by diffusion
11. Mass transfer between phases. Mass transfer by diffusion in non-steady state
12. Review

## 4. TEACHING and LEARNING METHODS - EVALUATION

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|---|---|
| **DELIVERY**<br>*Face-to-face, Distance learning, etc.* | In class teaching (power point presentation and blackboard writing)<br>Theory and problem solving<br>Class notes |

| | |
|---|---|
| **USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY**<br>*Use of ICT in teaching, laboratory education, communication with students* | Solution of exercises that require the use of H / Y<br>Using H/Y in lectures (power point, html) |
| **TEACHING METHODS**<br>*The manner and methods of teaching are described in detail.*<br>*Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.*<br><br>*The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS* | |
| **STUDENT PERFORMANCE EVALUATION**<br>*Description of the evaluation procedure*<br><br>*Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other*<br><br>*Specifically-defined evaluation criteria are given, and if and where they are accessible to students.* | I. Final written examination (100% of the final course grade in THEORY) that includes:<br>- Multiple choice questions or Right/Wrong questions<br>- Short answer questions<br>- Judgment questions<br>- Descriptive, assay type questions<br>- Calculation problems<br><br>II. Final written examination (100% of the final course grade in LABORATORY) that includes:<br>- Calculation problems<br>- Judgment questions |

| *Activity* | *Semester workload* |
|---|---|
| Lectures | 39 |
| Tutorial | 26 |
| Homework | 25 |
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| | |
| Study hours | 35 |
| Total contact hours and training | ***125*** |

## 5. ATTACHED BIBLIOGRAPHY


1) NOTES OF FOOD ENGINEERING. Part I. S. YANNIOTIS. AUA, 2011 (in Greek).
2) FOOD ENGINEERING, 2nd Edition, X. N. LAZARIDES. S. GIAHOUDIS-M. GIAHOUDIS, 2007 (in Greek).
3) SOLVING PROBLEMS IN FOOD ENGINEERING, STAVROS YANNIOTIS, Springer, 2008.
4) INTRODUCTION TO FOOD ENGINEERING, P.R. SINGH and D>R> HELDMAN, 2nd Edition, Academic Press, 1993 (in Greek).