COURSE OUTLINE

1. GENERAL

SCHOOL	FOOD AND NUTRITIONAL SCIENCES		
ACADEMIC UNIT	FOOD SCIENCE AND HUMAN NUTRITION		
LEVEL OF STUDIES	BACHELOR OF SCIENCE		
COURSE CODE	**3410**	**SEMESTER**	4TH
COURSE TITLE	UNIT OPERATIONS IN FOOD PROCESSING		

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 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).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Field of Science & Engineering
PREREQUISITE COURSES:	Principles of Food Engineering, 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 objective of this course is the student:
1) to acquire knowledge on the basic unit operations that are used in food processing plants i.e. evaporation, filtration, extraction, etc. More specifically, the student should understand the principles governing these processes, know the equipment involved and describe and explain their operation.
2) to acquire the skill in analysis and mathematical description of the main relations between the design and operating parameters of these processes and calculate them.

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

• describe the various types of evaporators used in liquid food concentration and calculate the effect of operating parameters on the concentration of the final product, evaporation temperature, energy consumption, etc. Also to describe and explain the different ways of saving energy in evaporation
• calculate the properties of air using a psychrometric chart and the required air flow rate in a hot air drier. Describe the various types of dryers, distinguish the comparative advantages of each one and calculate the necessary time for drying a product
• understand and describe the cooling cycle and the corresponding equipment. Calculate the coefficient of performance of the equipment and the heat load of a refrigerator or a cold room
• understand and describe extraction, understand the mass transfer phenomena involved and calculate the concentration of the extracted substance in the different streams as well as the required extraction time
• understand and describe a membrane separation system and distinguish between osmosis, ultrafiltration and microfiltration
• understand and describe separation by centrifugation, filtration and sieving and the systems for grinding, mixing, extrusion and distillation. Perform basic calculations for these systems

By solving problems, the student will acquire the skill to calculate certain operating and design parameters in unit operations in food processing and compare different alternative solutions to achieve high process efficiency and high product quality.

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. Liquid food concentration. Single and multiple effect evaporators
2. Analysis of an evaporator, energy conservation. Freeze concentration
3. Psychrometry. Drying theory
4. Drying methods and dryers
5. Refrigeration cycle. Refrigeration and freezing systems. Heat pump
6. Centrifugation and Filtration
7. Membrane separation. Reverse osmosis, ultrafiltration, microfiltration
8. Liquid / liquid extraction and solid / liquid extraction. Supercritical fluid extraction
9. Distillation. Differential distillation, equilibrium distillation, steam distillation, distillation columns
10. Extrusion and Mixing
11. Size reduction and Screening
12. Review

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	In class teaching (power point presentation and blackboard writing) Theory and problem solving Class notes
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Solution of exercises that require the use of H / Y Using H/Y in lectures (power point, html)
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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.* *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 *Description of the evaluation procedure* *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* *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: - Multiple choice questions or Right/Wrong questions - Short answer questions - Judgment questions - Descriptive, assay type questions - Calculation problems II. Final written examination (100% of the final course grade in LABORATORY) that includes: - Calculation problems - Judgment questions

Activity	*Semester workload*
Lectures	39
Tutorial	26
Homework	25
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.