COURSE OUTLINE

1. GENERAL

SCHOOL	AGRICULTURAL SCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**FST_400**	**SEMESTER OF STUDIES**	4th
COURSE TITLE	FOOD ENGINEERING II		

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**	**ECTS CREDITS**
Lectures	3	
Exercises	2	
Total	**5**	**5**
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (4).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Compulsory Special Background Skills Development
PREREQUISITE COURSES:	There are no prerequisite courses
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBPAGE (URL)	https://eclass.upatras.gr/

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 course aims to achieve the following learning outcomes:
– the acquisition of knowledge in the basic engineering principles that govern the physical processes during food processing (liquid transport, mechanical separations - sieving, filtration, sedimentation, and centrifugation - homogenization, segmentation, mixing and fluidization)
- the recognition, understanding and interpretation of natural phenomena using these processes
– the ability to mathematically describe and evaluate the contribution of each phenomenon or parameter to the evolution of the process
– the acquisition of experience applying the above knowledge to industrial-type processes and equipments.

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 | *Search for, analysis and synthesis of data and information, with the*

information, with the use of the necessary technology *Adapting to new situations* *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*use of the necessary technology* *Adapting to new situations* *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*

- Search for, analysis, and synthesis of data and information using the necessary technologies.
- Decision making
- Autonomous work
- Teamwork
- Work in an interdisciplinary environment
- Design and project management
- Promotion of free, creative, and inductive thinking

3.SYLLABUS

- **Pumping**: Bernoulli's theorem, pump characteristic parameters, suction head and cavitation, pump selection criteria, types of pumps, pump applications, operating principle and steam ejector efficiency.
- **Fluidization**: Fluidization theory, fluidization applications.
- **Sieving**: Particle size analysis, sieving applications.
- **Filtration:** Darcy's law, relationships between filtration parameters, filtration with constant flow, filtration with constant pressure, filtering media, auxiliary filtration media, filtration devices, filtration applications.
- **Sedimentation**: Stokes' and Newton's laws and equations, calculation of sedimentation area, sedimentation applications.
- **Centrifugation:** Centrifugal separation of immiscible liquids, centrifugal clarification, centrifugal sludge separation, centrifugal filtration, centrifugation devices, cyclones, centrifugation applications.
- **Size reduction**: Size reduction equipment selection criteria, size reduction equipments, energy requirements of size reduction, size reduction applications.
- **Mixing:** Solid mixing, liquid and paste mixing, mixing applications.
- **Homogenization - Emulsification:** Surface tension, emulsifiers, methods and devices for emulsification-homogenization, emulsification-homogenization applications.

<u>Laboratory exercises:</u>

• Mass balances and evaporative capacity of a spray dryer
• Measurement of viscosity in Newtonian and non-Newtonian fluids
• Measurement of fluid flow - Measurement of pressure drop in pipelines and fluid flow components
• Pumps - Performance study of a gear pump

• Study of fluidization characteristics in a gas/solid system. • Study of heat transfer by conduction under unsteady state • Determination of heat transfer coefficients in a tubular heat exchanger and in a plate heat exchanger - Energy balances • Study of factors affecting the performance of ball milling - Determination of particle size distribution of granular foods. • Study of the operating parameters of a laboratory filter press. • Study of parameters affecting the performance of a laboratory centrifugal disk separator in the separation of two immiscible liquids and a centrifugal clarifier. • Energy requirements during stirring/mixing of liquid foods. • Homogenization.

4. **TEACHING AND LEARNING METHODS - EVALUATION**

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face teaching, Experimental activities, Laboratory training
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of Information and Communication Technologies (ICTs) (e.g.powerpoint presentation) in teaching, laboratory training with experiments. Communication with students: through e-mail, department's website and platform e-class. The lectures' content of the course for each chapter are uploaded on the internet, in the form of a series of pdf files, where students can freely download them from the platform e-class.upatras.gr
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*	See table below
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,*	Language of Evaluation: Greek **<u>Evaluation Methods:</u>** • Mandatory attendance at a minimum of 80% of laboratory exercises. • Written final exams in the theoretical part of the course, including problem-solving (50% of the final grade). • Written final exams in the laboratory part of the

Activities	***Work Load per semester***
Lectures	39
Independent Study	50
Laboratory exercises	20
Writing laboratory exercises	16
Total number of hours for the Course (25 hours of work-load per ECTS credit)	**125**

laboratory work, clinical examination of patient, art interpretation, other *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	course, including multiple-choice questions, short-answer questions, and problem-solving (50% of the final grade). • Optional written assignments in the laboratory exercises (20% of the laboratory part of the course grade if submitted). The evaluation criteria are presented and explained to the students at the beginning of the semester. Grading scale: 0 to 10. Minimum passing grade: 5. Examination time during final exam: 3 hours.

5. **ATTACHED BIBLIOGRAPHY**

-**Recommended Bibliography:**

• McCabe W., Smith J., Harriott P., Basic Principles and Calculations in Chemical Engineering, 6th Edition, Translation: Tziola Publications, Thessaloniki, 2003.

• Pitts D., Sissom L., Heat Transfer, Schaum Series, 2nd Edition, Translation: Tziola Publications, Thessaloniki, 2001.

• Himmelblau D.M., Riggs J.B., Basic Principles and Calculations in Chemical Engineering, 7th Edition, Translation: Tziola Publications, Thessaloniki, 2006

• Fryer P.J, Pyle, D.L., Reilly C.D., Chemical Engineering for the Food Industry, Chapman & Hall, 1997

-**Related scientific journals:**

• Journal of Food Engineering