SCHOOL	FACULTY OF ENVIRONMENT		
ACADEMIC UNIT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**FST504**	**SEMESTER**	5
COURSE TITLE	**INDUSTRIAL FERMENTATIONS**		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercise, 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	2	
Laboratory exercise	2	
Total	4	6
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*	Specialised general knowledge
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in Greek)
COURSE WEBSITE (URL)	

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*

Upon the successful completion of the course, the student will be able:

- To acknowledge the metabolic activities and pathways that entail the formulation of fermentation products
- To be familiar with the utilisation of industrial microbial strains to generate food products
- To know the basic principles of applying microorganisms in food production (biomass, metabolites, fermented foods etc) in the food industry
- To know recent, up-to-date and automated methods of microbial growth assessment
- To know and understand the main types of bioreactors along with key principles of bioreactors operation
- To understand the principal categories of microbial fermentations

- To know the main industrial applications with respect to the utlisation of microorganisms to produce food products for the food industry sector
- To understand how to estimate key fermentation parameters and stoichiometric reactions.

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 *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*	*Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *.....* *Others...* *.....*

- Adapting to new situations
- Decision-making
- Working independently
- Team work
- Criticism and self-criticism
- Production of free, creative and inductive thinking
- Search for, analysis and synthesis of data and information, with the use of the necessary technology

SYLLABUS

Theoretical part of the course:

The course of Industrial Fermentations describes the development of bioprocesses to generate fermentation products though the utilisation of microbial entities, that could be further applied in food industry. Moreover, the constantly emerging field of white biotechnology is also included, incorporating both traditional fermented foods (wine, beer, cheese production) and biotechnologically produced high added-value products (chemicals, platform chemicals, biopolymers etc). The aforementioned products can be further introduced in food manufacturing sector and similar industries, encompassing also the development of novel biorefinery concepts.

During the course, students are expected to understand the metabolic activities and the pathways that lead to the formation of fermentation products, to acknowledge the basic types and principles of bioreactors operation, the principal types of fermentation processes and strategies, to learn about the most significant applications of microbial entities to formulate products for the food industry, and understand the methods to estimate fermentation parameters and stoichiometric reactions.

Laboratory exercises:

- Determination of microbial concentration
- Microbial growth curve
- Estimation of specific growth rate (μ)
- Estimation of substrate consumption rates-Yield of biomass
- Solid state fermentation (SSF)
- Bacterial cellulose (BC) production

- Continuous fermentation to produce wine, beer or potable alcohol
- Chemostat
- Microorganisms immobilisation techniques
- Production of single cell protein (SCP)

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	**Use of information technology on data collection and information, in teaching and communication. Communication with students via web, e-mail, e-class and online folder sharing options etc.**
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*	

Activity	***Semester workload***
Lectures	78
Laboratory exercise	26
Total contact hours and training	***104***

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.*	Evaluation procedure performed in Greek Evaluation procedures: Written evaluation in questions of scaling difficulty • Two examination tests are performed in-between semester • Final examination The final grade is determined by the following formula: 40% of laboratory exercise grade and 60% of theory examination grade.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Aggelis, G., Microbiology and Microbial Technology, 2007, Editions Stamoulis (In Greek)

Spiliotis V., Batrinou, A, Industrial microbiology, 2013, Editions Disigma (In Greek)

Nerantzis, E., Tataridis, P., Logothetis, S., Biotechnology and Industrial Fermentations, 2014, Editions Emvryo (In Greek)

Performance Statistics of the last 2years			
Grade (descending order)	**absolute frequency**	**relative frequency %**	**sum of success rates per class**
INDUSTRIAL FERMENTATIONS			
10	1	1%	1%
9	7	5%	6%
8	24	18%	24%
7	27	20%	44%
6	74	56%	100%
	133	100%	