SYLLABUS

1. Course title:

BIOREACTION SYSTEMS

2. Code:

3. Cycle of study:

1

4. ECTS credits:

3

5. Type of course:

○ Mandatory ◉ Elective

6. Prerequisites:

7. Class restrictions:

8. Duration / semester:

1 5

9. Weekly contact hours:

9.1. Lectures: 2

9.2. Seminars: 0

9.3. Laboratory/Practice classes: 1

10. Faculty:

Faculty of Technology

11. Department/study program:

Food Quality and Safety

12. Lecturer:

Dr. Ivan Petric, PhD, Associate Professor

13. Lecturer's e-mail:

ivan.petric@untz.ba

14. Web site:

www.tf.untz.ba

15. Course aims:

- students to be familiar with the basics of analysis of bioreaction systems,
- students to be familiar with the numerical software package POLYMATH in solving problems in the field of bioreaction systems,
- students learn how to solve problems in the field of the course.

16. Learning outcomes:

After the successful completion of the learning process, the student is expected to know, understand and be able to:
- review, evaluate and differentiate different principles demonstrated through teaching,
- solve different weight-weighted problems with or without application of the numerical software package Polymath,
- analyzes the available literature for solving various problems of this course.

17. Course content:

1. INTRODUCTION (Basic definitions and concepts. Types and application of bioreactors. Types of fermentation) 2. BIOREACTION SYSTEMS FOR ENZYMATIC FERMENTATION (Mechanism. Michaelis-Menten kinetics. Briggs-Haldane model. Kinetics and kinetic Parameters. Determination of kinetic parameters. Design equations for fermenters. Mechanism and kinetics of inhibition). 3. BIOREACTION SYSTEMS FOR MICROBIAL FERMENTATION (Types of microbial fermentation. Mechanism. Cell growth phases. Cell growth rate equations. Determination of kinetic constants. Stoichiometry. Mass balances of cell, substrate, product. Design equations for bioreactors (cells, substrate, product). Wash-out. Oxygen-limiting fermentation. Product-limiting microbial fermentation. Substrate concentration at maximum rate of fermentation. First and second order of poisoning (kinetics, kinetic parameters, recycle, optimum). Substrate-limiting microbial fermentation. Optimum performance of bioreactors.)

18. Learning methods:

- lectures with active participation and discussion of students,
- experimental exercises (Numerical Software Package Polymath),
- consultations.

19. Assessment methods:

After half of the semester, students take Quiz and Test 1, which cover up to date the topic from lectures and exercises. At the end of the semester, students take Test 2. The professor will promptly notify students of the terms of each test of knowledge. Quiz is taken through interactive computer module Enzyme Man. The Tests 1 and 2 are taken in writing. Each Test is consisted of 20 short theoretical questions related to the material being studied. The seminar paper contains a topic and a calculation problem from the field that is being taught in lectures and exercises. The seminar paper is submitted to the professor in writing and reviewed and then presented in oral. Students will receive detailed instructions for preparing and defending the seminar work. For each Quiz, Test-theory, and Test-calculation problem, a student must achieve at least 50% of the total points predicted for specific test of knowledge. The final exam can be organized in writing and orally, depending on the number of points awarded.

20. Assessment components:

The exam score is based on the total number of points that a student has accomplished by completing the preexamination commitments and taking the exam, and it contains a maximum of 100 points, and is determined as follows: attendance and activity (3 points), Quiz (10 points) , Test 1 (25 points), Test 2 (25 points), Seminar work (25 each), Final Exam (12 points). In order to pass the course, a student has to accomplish at least 54 points.

21. Required reading list:

1. Van't Riet, K., Tramper, J. (1991): Basic Bioreactor Design, M. Dekker, New York
2. Nielsen, J., Villadsen, J., Lidén, G. (2003): Bioreaction Engineering Principles (Second Edition), Kluwer Academic/ Plenum Publishers, New York

22. Web sources:

23. Applicable starting from the academic year:

2015/2016

24. Adopted in the Faculty/Academy session: