SYLLABUS

1. Course title:

Energy efficiency of chemical processes

2. Code:

3. Cycle of study:

1

4. ECTS credits:

5

5. Type of course:

(•) Mandatory ( ) Elective

6. Prerequisites:

7. Class restrictions:

No restrictions

8. Duration / semester:

1 7

9. Weekly contact hours:

9.1. Lectures: 3

9.2. Seminars: 0

9.3. Laboratory/Practice classes: 1

10. Faculty:

Faculty of Technology

11. Department/study program:

Chemical Engineering and Technologies

12. Lecturer:

Elvis Ahmetović, Full Professor

13. Lecturer's e-mail:

elvis.ahmetovic@untz.ba

14. Web site:

www.tf.untz.ba

15. Course aims:

Course aims are to:
- understand basic knowledge about energy efficiency in chemical-technological processes,
- understand the importance of application of systematic methods (pinch technology and mathematical programming) from the aspect of energy efficiency, process economics, and environmental protection,
- understand, critically analyze and solve problems of different complexity in which the objective is to minimize energy consumption,
- improve written and verbal communication skills.

16. Learning outcomes:

After completing the course and the teaching obligations students will be able to:
- use and analyze the available literature in order to obtain the necessary information,
- understand the basics of energy efficiency and rational use of energy in processes,
- solve problems using heat integration methods, assess the results of the calculation and draw conclusions,
- design a heat-integrated flow-sheet including heat exchanger network with minimum consumption of energy,
- present the results in written and verbal forms.

17. Course content:

Presentation of syllabus. Introduction to the energy efficiency of chemical-technological processes. Interactions between a power generation system, a technological process and the environment. Analysis of the production and consumption of energy (steam, electricity and cooling water) in the process. Opportunities for process heat integration (the use of the waste heat for preheating of streams, reuse of steam condensates). Systematic methods for improving the energy efficiency of the process (pinch technology and mathematical programming). The concept of pinch technology (basics of heat exchange and heat recovery in a process, temperature-enthalpy diagram, diagram of composite curves of hot and cold process streams, problem table, grand composite curve diagram, heat exchanger network design). Selection of the optimal minimum temperature difference in the heat exchanger network. The design of heat exchanger network by using mathematical programming.

18. Learning methods:

Lectures, laboratory (computer) exercises, seminars, consultations.

19. Assessment methods:

For checking the acquired knowledge in the course, written and oral examinations are used. Written examinations consist of knowledge examinations during the semester (Test I) and after the end of the semester (Test II), and an oral examination which consists of a short talk and discussion. Tests (I and II) consist of theoretical questions and calculation problems. During the semester students will be assigned with seminar works that should be completed and submitted by the end of the semester. Assessment is performed through the oral presentation of seminar work. Students should have a positive result after each assessment with at least 50% of the required knowledge. Student must achieve a minimum of 54 cumulative points in order to pass the course.
Students who intend to access the exam should be registered by the teaching assistant at latest two days before the exam. Registration includes A4 notebook on which it is necessary to write the name of the student, department, index number and academic year.

20. Assessment components:

Students obligations:	Weight (%):
Test I	40
Seminar work	20
Test II-Final exam	40

21. Required reading list:

1. Kemp. I. C. (2007). Pinch Analysis and Process Integration. A User Guide on Process Integration for the Efficient Use of Energy. Oxford: Butterworth-Heinemann.
2. Ahmetović, E. (2010). Toplinske operacije u procesnom inženjerstvu. Tuzla: Off-Set.
3. Ahmetović, E. (2016). Odabrana poglavlja hemijsko-procesnog inženjerstva. Tuzla: Univerzitet u Tuzli, Tehnološki fakultet.

22. Web sources:

23. Applicable starting from the academic year:

2015/2016

24. Adopted in the Faculty/Academy session: