
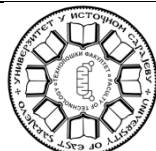


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|---|-----------------|---|--|-----------------|----------------------|---|------|--|
|  |                 | UNIVERSITY OF EAST SARAJEVO<br>Faculty of Technology  |  |                 |                      |  |      |  |
|   |                 | Study program: Chemical engineering and technology  |  |                 |                      |   |      |  |
|   |                 | I STUDY CYCLE   |  | II STUDY YEAR   |                      |   |      |  |
| Course name   |                 | ENGINEERING THERMODYNAMICS  |  |                 |                      |   |      |  |
| Department  |                 | Department for process engineering-Faculty of Technology  |  |                 |                      |   |      |  |
| Course code   |                 |   | Course status  |                 | Semester             |   | ECTS |  |
|   |                 |   | Obligatory   |                 | III                  |   | 6    |  |
| Teacher   |                 | PhD Mitar Perusic, full professor   |  |                 |                      |   |      |  |
| Assistant   |                 | Dusko Kostic, assistant   |  |                 |                      |   |      |  |
| Hours number (weekly)   |                 |   | Individual work (hours per semester)   |                 |                      | Student's work coefficient, S <sub>0</sub>  |      |  |
| Lectures  | Class Exercises | Laboratory Exercises  | Lectures   | Class Exercises | Laboratory Exercises | S <sub>0</sub>  |      |  |
| 3   | 2               | 0   | 45   | 30              | 0                    | 1.4   |      |  |
| Total hours number (hours per semester)<br>3*15 + 2*15 + 0*15 = 75                |                 |   | Total hours number (hours per semester)<br>3*15*1.40 + 2*15*1.40 + 0*15*1.40 = 105 |                 |                      |   |      |  |
| Total hours number (hours per semester, teacher + student): 75+ 105 = 180         |                 |   |  |                 |                      |   |      |  |
| Learning outcomes   |                 | 1. To find and use literature data related to energy and thermodynamics of the system;<br>2. To recognize the thermodynamic system, knowledge of the thermodynamic properties of ideal and real gases and vapors;<br>3. Mathematically analyze energy transfer across the boundaries of the thermodynamic system;<br>4. Analyze thermodynamic cycles;<br>5. Analyze, solve, present task solutions and compare results, and recognize the application and importance of thermodynamics in practice. Know the difference between an ideal and a real thermodynamic process.  |  |                 |                      |   |      |  |
| Conditionality  |                 | No.   |  |                 |                      |   |      |  |
| Teaching methods  |                 | Lectures, class exercises and individual work   |  |                 |                      |   |      |  |
| Course content per weeks  |                 | 1. Introduction to the course. Basic concepts of thermodynamics. The concept and forms of energy. Units and dimensions.<br>2. Ideal gas. Ideal gas equation-thermodynamic aspects.<br>3. Working body energy. Internal energy and amount of heat. Thermal capacity.<br>4. The term thermodynamic system. The first principle of thermodynamics, definition and mathematical model.<br>5. The concept of enthalpy. Examples of enthalpy changes in the thermodynamic system in chemical reactions. State changes in the p-v coordinate system.<br>6. The second principle of thermodynamics. Entropy and mathematical model of the second principle of thermodynamics. Examples of the change in entropy of a thermodynamic system in chemical reactions. Colloquium 1.<br>7. Reverse and irreversible processes. Circular processes.<br>8. Thermal T-s diagram and state changes.<br>9. Invert the Carnot cycle.<br>10. Joule return cycle.<br>11. Maximum operation.<br>12. Real gases and vapors. Deviations from the ideal gas equation of state.<br>13. Phase transformations and latent heat. Water and physicochemical properties of water. Water vapor as a working medium.<br>14. Diagrams p-v, T-s and h-s for water vapor.<br>15. Carnot's and Rankin-Clausius cycle for water vapor. Analysis of engineering thermodynamics chapters (seminar paper presentation). Colloquium 2. |  |                 |                      |   |      |  |
| Obligatory literature   |                 |   |  |                 |                      |   |      |  |
| Author/s  |                 | Name, publisher   |  |                 | Year                 | Page  |      |  |
| D. Malic  |                 | Thermodynamic and Thermotechnik, GK, Beograd, 7 <sup>th</sup> issue   |  |                 | 1977                 | 1-92  |      |  |
| Additional literature   |                 |   |  |                 |                      |   |      |  |
| Author/s  |                 | Name, publisher   |  |                 | Year                 | Page  |      |  |
| B. Pejovic, M. Perusic  |                 | Thermodynamic for engineers-solution manual, Faculty of Technology  |  |                 | 2012                 | 1-332   |      |  |
| M. Novakovic, M. Djuric   |                 | Technical thermodynamic, Faculty of Technology, Novi Sad  |  |                 | 1998                 | 1-304   |      |  |

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|---|--|---------------|-------------------|
| O. Singh  | Applied Thermodynamics, New Age International Limited            | 2006          | 1-330             |
| B. Djordjevic, V. Valent, S. Serbanovic                             | Solution manual, Thermodynamic and Thermmotechnic, TMF, Belgrade | 2004          | 1-223             |
| <b>Obligations, types of knowledge evaluation, final assessment</b> | <b>Types of evaluation</b>                                       | <b>Points</b> | <b>Percentage</b> |
|   | Pre-exam obligation  |               |                   |
|   | Lectures and exercises participation and activity                | 6             | 6 %               |
|   | Seminar work   | 14            | 14 %              |
|   | Colloquium 1   | 25            | 25 %              |
|   | Colloquium2  | 25            | 25 %              |
|   | Final exam   |               |                   |
|   | Final exam (verbal)  | 30            | 30 %              |
|   | TOTAL  | 100           | 100 %             |
| <b>Web pages</b>  | <a href="http://www.tfzv.ues.rs.ba">www.tfzv.ues.rs.ba</a>       |               |                   |
| <b>Date</b>   |  |               |                   |