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| Course ID: HFH356 | Course name: PHYSICAL CHEMISTRY III | | |
| Cycle: FIRST | Year: THIRD | Semester: V | ECTS credits: 8 |
| Course status: MANDATORY | | Total course hours: Lectures: 60 Auditory: 30 Laboratory: 30 | |
| Teaching participants: | Teachers and associates with expertise in the field to which the subject belongs | | |
| Prerequisite for enrollment: | - | | |
| Course aims: | Acquiring basic knowledge about the structure, properties and spectra of atoms and molecules, chemical bonds from the standpoint of quantum mechanics. | | |
| Thematic course units: | <ol style="list-style-type: none">1. The structure of the atom. Black body radiation. Photoelectric effect. Compton effect. Optical and X-ray spectra.2. Bohr model of the hydrogen atom. Bohr-Sommerfeld model of the atom.3. The quantum numbers. Vector model of the atom. Multiplicity term.4. Spectra of many-electronic atoms.5. De Broglie relation. The wave equation. Particle in a box. The tunnel effect.6. Hydrogen atom in wave mechanics. Orbitals and their spatial orientation.7. The structure of many-electron atoms. Helium atom.8. Chemical bonds. Ionic bond. Covalent bond. Valence bond theory.9. Theory of molecular orbitals. Hückel theory of molecular orbital.10. Metallic bond. Theories of chemical bonding in complexes.11. Electric and magnetic properties of molecules.12. Intermolecular forces.13. Molecular spectra. Rotational spectra. Vibrational spectra. Raman spectra. Electronic spectra.14. Fluorescence. Phosphorescence. Stimulated emission. Photoelectron spectra.15. Nuclear magnetic resonance. Electron spin resonance. | | |
| Learning outcomes: | Knowledge: Acquired basic knowledge about the structure and properties of atoms and molecules, chemical bonds, atomic and molecular spectra. Skills: The student will be able to connect the basics of quantum theory with the structure of atoms and molecules, perform measurements in the physico-chemical laboratory independently or as a team, present and process measurement results related to the properties and spectra of atoms and molecules. | | |

| | <p>Competences: Application of acquired knowledge and skills in professional and specialist subjects.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|------------------|--|--|----------|---------------|----------------|---------------------|---|---|---------------------|----|---|-------------|------|------|---------------|----|----|-------|-----|----|--------------------|--|--|-------|-------------|--------------|------|---|-------|-------|---|---|-------|---|---|-------|---|---|-------|---|---|--------|----|---|
| Teaching methodology: | <p>Lectures (oral presentation and interactive classes) Auditory exercises Laboratory exercises</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Assessment methods and grading system¹: | <table border="1"> <thead> <tr> <th colspan="3">Grading criteria</th> </tr> <tr> <th>Criteria</th> <th>Maximal score</th> <th>Required score</th> </tr> </thead> <tbody> <tr> <td>1. Class attendance</td> <td>0</td> <td>0</td> </tr> <tr> <td>2. Class activities</td> <td>15</td> <td>8</td> </tr> <tr> <td>3. Midterms</td> <td>2×20</td> <td>2×11</td> </tr> <tr> <td>4. Final exam</td> <td>45</td> <td>25</td> </tr> <tr> <td>Total</td> <td>100</td> <td>55</td> </tr> <tr> <th colspan="3">Scores and grading</th> </tr> <tr> <th>Score</th> <th>Grade (BiH)</th> <th>Grade (ECTS)</th> </tr> <tr> <td>< 55</td> <td>5</td> <td>F, FX</td> </tr> <tr> <td>55–64</td> <td>6</td> <td>E</td> </tr> <tr> <td>65–74</td> <td>7</td> <td>D</td> </tr> <tr> <td>75–84</td> <td>8</td> <td>C</td> </tr> <tr> <td>85–94</td> <td>9</td> <td>B</td> </tr> <tr> <td>95–100</td> <td>10</td> <td>A</td> </tr> </tbody> </table> | Grading criteria | | | Criteria | Maximal score | Required score | 1. Class attendance | 0 | 0 | 2. Class activities | 15 | 8 | 3. Midterms | 2×20 | 2×11 | 4. Final exam | 45 | 25 | Total | 100 | 55 | Scores and grading | | | Score | Grade (BiH) | Grade (ECTS) | < 55 | 5 | F, FX | 55–64 | 6 | E | 65–74 | 7 | D | 75–84 | 8 | C | 85–94 | 9 | B | 95–100 | 10 | A |
| Grading criteria | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Criteria | Maximal score | Required score | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Class attendance | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. Class activities | 15 | 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Midterms | 2×20 | 2×11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. Final exam | 45 | 25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 100 | 55 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Scores and grading | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Score | Grade (BiH) | Grade (ECTS) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| < 55 | 5 | F, FX | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 55–64 | 6 | E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 65–74 | 7 | D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 75–84 | 8 | C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 85–94 | 9 | B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 95–100 | 10 | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Literature²: | <p>Mandatory literature:</p> <ol style="list-style-type: none"> Sabina Gojak, <i>Zbirka zadataka iz fizikalne hemije (struktura materije)</i>, Prirodno-matematički fakultet, Sarajevo, 2012. <p>Supplementary literature:</p> <ol style="list-style-type: none"> P.W. Atkins, <i>Physical Chemistry</i>, 5th Edition, Oxford University Press, Oxford, 1994. Drago Grdenić, <i>Molekule i kristali</i>, Školska knjiga, Zagreb, 2005. Dragica Minić, Ankica Antić-Jovanović, <i>Fizička hemija</i>, Fakultet za fizičku hemiju i Biološki fakultet Univerziteta u Beogradu, Beograd, 2005. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

¹The grading structure for each subject is determined by the Council of the organizational unit before the beginning of the academic year in which the subject is taught as per Article 64, paragraph 6 of the Law on Higher Education of Sarajevo Canton

²The Senate of the higher education institution, as an institution, or the Council of the organizational unit of the higher education institution, as a public institution, determines by a special decision, which is published on its website before the beginning of the academic year obligatory, mandatory and recommended textbooks and manuals, as well as other recommended literature based on which exams are prepared and taken as per Article 56, paragraph 3 of the Law on Higher Education of the Sarajevo Canton