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| **Course code** | CC3 |
| **Type and description** | **CC** - Core Course |
| **ECTS credits** | 2 |
| **Course name** | **Advanced Physical Chemistry** |
| **Course name in Polish** | Zaawansowana chemia fizyczna |
| **Language of instruction** | English |
| **Course level** | 8 PRK |
| **Course coordinator** | prof. dr hab. inż. Piotr Ulański |
| **Course instructors** | prof. dr hab. Halina Abramczyk, dr hab. Beata Brożek-Płuska, dr hab. inż. Sławomir Kadłubowski, dr inż. Adam Sikora, prof. dr hab. inż. Dorota Światła-Wójcik, prof. dr hab. inż. Piotr Ulański, dr hab. Marian Wolszczak  |
| **Delivery methods and course duration** |

|  | **Lecture** | **Tutorials** | **Laboratory** | **Project** | **Seminar** | **Other** | **Total of teaching hours during semester** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Contact hours | 25 | 0 | 0 | 0 | 0 | 0 | 25 |
| E-learning | No | No | No | No | No | No |  |
| Assessment criteria (weightage) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |  |

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| **Course objective** | An aim of the course is to introduce the students to the concepts, theoretical basics and applicability of advanced techniques of physical chemistry. |
| **Learning outcomes** | After the course student:1. describes and explains fundamental concepts, theoretical basics and applicability of selected advanced techniques and methods of physical chemistry (**W1 P8S\_EG**).2. selects adequate method or technique for a given task (**U1 P8S\_UW**, **K1 P8S\_KK**) |
| **Assessment methods** | Verification methods of learning outcomeseffects **W1 P8S\_EG, U1 P8S\_UW,K1 P8S\_KK**- written scientific essayThe final grade consists of:The result of the written essay - 100% |
| **Prerequisites** | none |
| **Course content with delivery methods** | LECTURE1. Advanced chemical kinetics. Rapid chemical kinetic techniques: stopped-flow, flash photolysis and pulse radiolysis technique. Kinetic simulations.
2. Basics of radiation chemistry. Matrix isolation. Radiolysis of water and aqueous solutions.
3. Radiolysis of organic solvents and ionic liquids.
4. Molecular simulation concepts and applications in solution chemistry.
5. Light-scattering techniques for analysis of properties and dynamics of nanomaterials and polymers. Classical (static) Rayleigh light scattering and its analytical applications. Dynamic light scattering and related techniques.
6. Physicochemical methods in the study of organized systems. The design and development of molecular probes.
7. Chemical aspects of photodynamic antitumor therapy and diagnostic.
8. Photoelectrochemistry. Solar to fuels conversions technologies. Thermodynamics of the conversion of solar radiation.
9. Introduction to the advanced spectroscopic techniques used in chemistry, biology and medicine with the particular emphasis on problems solving to determine molecular structure. Advanced imaging techniques with the use of different types of spectroscopic techniques with particular emphasis on vibrational spectroscopy.
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| **Basic reference materials** | 1. M. Spotheim-Maurizot, M. Mostafavi, T. Douki, J.Belloni (Eds.), Radiation Chemistry from Basics to Applications in Material and Life Sciences, EDP Sciences, France, 2008.
2. Christopher J. Cramer. Essentials of Computational Chemistry. Theories and Models. John Wiley & Sons, LTD 2004.
3. M.P. Allen, D.J. Tildesley, Computer Simulation of Liquids, Oxford University Press, Oxford, 1987.
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| **Other reference materials** | Current scientific articles, given by the lecturer. |
| **Average student workload outside classroom** | 10 hrs |
| **Comments** | - |
| **Last update** | 2019-04-10 |