

Course Syllabus**I. General Information**

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| Course name | Organic chemistry – basic course |
| Programme | Biotechnology |
| Level of studies (BA, BSc, MA, MSc, long-cycle MA) | BSc |
| Form of studies (full-time, part-time) | part-time |
| Discipline | Biological sciences |
| Language of instruction | English |

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| Course coordinator/person responsible | dr Artur Banach |
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| Type of class (<i>use only the types mentioned below</i>) | Number of teaching hours | Semester | ECTS Points |
|---|--------------------------|----------|-------------|
| lecture | 30 | II | 6 |
| tutorial | | | |
| classes | 30 | II | |
| laboratory classes | | | |
| workshops | | | |
| seminar | | | |
| introductory seminar | | | |
| foreign language classes | | | |
| practical placement | | | |
| field work | | | |
| diploma laboratory | | | |
| translation classes | | | |
| study visit | | | |

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| Course pre-requisites | General Chemistry, Inorganic Chemistry, Physico-chemistry of Biological Systems |
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II. Course Objectives

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| Acquire skills of the naming, writing formulas and classification main organic compounds, important for biotechnology, basing on their functional groups |
| Acquire knowledge about preparation and properties of organic compounds |
| Acquire skills of the assigning of biosphere components to suitable organic groups |
| Acquire practical skills of carrying out chemical reactions by students |
| Learning of the analytical methods and basics of synthesis of organics |

III. Course learning outcomes with reference to programme learning outcomes

| Symbol | Description of course learning outcome | Reference to programme learning outcome |
|---------------------|--|---|
| KNOWLEDGE | | |
| W_01 | Student describes issues in the field of organic chemistry required to understand and interpret basic natural phenomena and processes | K_W02 |
| W_02 | Student presents the principles of health, safety work and ergonomics, indicates the psychophysical possibilities of a human in the work environment in laboratory of organic chemistry | K_W09 |
| SKILLS | | |
| U_01 | Student applies techniques and research tools in the field of organic chemistry for biotechnology students | K_U01 |
| U_02 | Student carries out observations and performs chemical measurements | K_U02 |
| U_03 | Student describes, explains and interprets chemical and physicochemical phenomena at an advanced level | K_U08 |
| U_04 | Student performs qualitative and quantitative analyzes of organic compounds by using classical and instrumental method | K_U10 |
| U_05 | Student uses statistical methods and information technology to describe natural phenomena as well as to analyze and process experimental data | K_U14 |
| U_06 | Student designs and performs research tasks or expertise in the field of organic chemistry. | K_U15 |
| SOCIAL COMPETENCIES | | |
| K_01 | Student possesses appropriate habits required to the work in scientific laboratories especially in organic chemistry, proceeds according to work safety regulations, knows how to react in states of danger. | K_K04 |

IV. Course Content

Lecture: The structure and properties of organic compounds – chemical bonds, electron configuration, polarity, intermolecular forces. Isomerism. The nomenclature of organic compounds. Saturated-, unsaturated hydrocarbons, aromatic hydrocarbons, alcohols, ethers, carboxylic acids, aldehydes, ketones, esters, amines, phenols, fats, carbohydrates – preparation, physical and chemical properties, mechanisms of reactions. Polymers, their structure and properties. Detergents and their properties. Amino acids and their properties. Peptides.

Classes: Safety principles for work in the Organic Chemistry Laboratory. General laboratory glassware and accessories used in the synthesis of organic compounds. Determination of organic carbon contents by means of Turin's method. Chemical properties of alkanes, alkenes and alkynes. Distillation of ethanol and determination properties of alcohols. Recognition of aldehydes and ketones. Carboxylic acids – characteristic reactions. Preparation of esters and ethers. Esterification reaction (primary, secondary and tertiary alcohols). Physical and chemical properties of lipids. Saponification reaction. Determination of iodine number. Extraction as an example of plant oil isolation. Properties of arens – benzene and its derivatives as examples. Characteristic reactions of

mono- and disaccharides. Determination of water hardness and detergents properties. Amino acids and proteins properties. Organic preparates purification by means of crystallization. Application on analytical tools in chemistry (statistics).

V. Didactic methods used and forms of assessment of learning outcomes

| Symbol | Didactic methods (choose from the list) | Forms of assessment (choose from the list) | Documentation type (choose from the list) |
|----------------------------|--|---|--|
| KNOWLEDGE | | | |
| W_01 | Conventional lecture | Written exam | Written exam Completed and evaluated test |
| | Laboratory analysis | Test | |
| W_02 | Laboratory analysis | Observation | Rating card / Report from observation |
| SKILLS | | | |
| U_01 | Laboratory classes | Report | Protocol / Print / Report file |
| U_02 | Laboratory classes | Report | Protocol / Print / Report file |
| U_03 | Laboratory analysis | Test | Completed and evaluated test |
| U_04 | Laboratory classes | Report | Protocol / Print / Report file |
| U_05 | Laboratory classes | Report | Protocol / Print / Report file |
| U_06 | Laboratory classes | Report | Protocol / Print / Report file |
| SOCIAL COMPETENCIES | | | |
| K_01 | Laboratory classes | Observation | Rating card / Report from observation |

VI. Grading criteria, weighting factors.....

Lecture: Written exam in the form of test - 90%, participation in the lectures - 10%

Classes: 3 tests – 90%, active participation in the classes - 5%, preparation of report – 5%

| Mark | Evaluation criteria | |
|-----------------------|---|---|
| very good (5) | the student realizes the assumed learning outcomes at a very good level | the student demonstrates knowledge of the education content at the level of 91-100% |
| overgood (4.5) | the student accomplishes the assumed learning outcomes an over good level | the student demonstrates knowledge of the education content at the level of 86-90 % |
| good(4) | the student accomplishes the assumed learning outcomes at a good level | the student demonstrates knowledge of the education content at the level of 71-85% |

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| quite good(3.5) | the student accomplishes the assumed learning outcomes at a quite good level | the student demonstrates knowledge of the education content at the level of 66-70% |
| sufficient (3) | the student accomplishes the assumed learning outcomes at a sufficient level | the student demonstrates knowledge of the education content at the level of 51-65% |
| insufficient (2) | the student accomplishes the assumed learning outcomes at an insufficient level | the student demonstrates knowledge of the education content below the level of 51% |

VII. Student workload

| Form of activity | Number of hours |
|--|-----------------|
| Number of contact hours (with the teacher) | 60 |
| Number of hours of individual student work | 90 |

VIII. Literature

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| Basic literature |
| Morrison R.T. , Boyd R.N. Organic Chemistry, Prentice Hall; 6th edition, 1992. Bruice P.Y. Organic Chemistry, 6th Edition, Prentice Hall, Pearson Education, Inc. 2011. Clayden J., Greeves N., Warren N., Wothers P.: Organic chemistry, Oxford University Press, Oxford 2012. Clayden J., Warren S.: Solutions Manual to accompany Organic Chemistry, 2nd edition, Oxford University Press, Oxford 2013. Loudon G.M.: Organic Chemistry, 4th edition, Oxford University Press, Oxford 2002. Solomons G., Fryhle C., Snyder S., Organic Chemistry, 11e, John Wiley & Sons, Inc. 2014. |
| Additional literature |
| Bruckner R.: Organic mechanisms, Reactions, Stereochemistry and Synthesis, Springer-Verlag, Berlin 2010. Putz M.V.: Carbon Bonding and Structures, Advances in Physics and Chemistry, Springer Science+Business Media B.V. 2011. Seager S.L., Slabaugh M.R. Organic and Biochemistry for Today, 6th Edition, Brooks/Cole, a division of Thomson Learning, Inc. 2008. Parsons A.F. Keynotes in Organic Chemistry, Blackwell Science Ltd. 2003. |