Title:	**Organic Chemistry**
Lecture hours:	45 hours of laboratory
Study period: (summer/winter)	summer/winter
Number of credits:	5
Assessment methods:	Final test
Language of instruction:	English
Prerequisites:	general chemistry
Course content:	• Saturated hydrocarbons, concept of conformation, conformational analysis of ethane and butane. Structure and systematic nomenclature of alkanes. Free radical reactions, halogenation of alkanes, oxidation of alkanes. Cycloalkanes, cyclohexane conformations. Unsaturated hydrocarbons, geometric isomerism, cis, trans and Z,E systems. Electrophilic addition to alkenes, Markovnikov rule. Carbocations, stability of carbocations, hyperconjugation. • Unsaturated hydrocarbons, hydrogenation of alkenes, radical and ionic polymerization, cycloaddition reactions, alkenes metathesis. • Aromatic hydrocarbons, structure of benzene. Aromatic electrophilic substitution, the influence of substituents on the direction of substitution. Aromatic heterocyclic compounds. • Halogen derivatives of hydrocarbons, nucleophilic substitution at a saturated carbon atom, mechanisms of SN1 and SN2, stereochemistry of nucleophilic substitution. Elimination reactions, mechanisms. Aromatic nucleophilic substitution. Organometallic compounds, Grignard reagents. • Oxygen compounds: alcohols and phenols, the reaction of replacing the hydroxyl group with other substituents, elimination. Oxidation of alcohols and phenols, reactions of diols. Ethers, decay of ethers. • Nitrogen compounds: amines, order of amines, basicity and nucleophilicity of amines, Hofmann elimination, diazonium salts, azo compounds. Nitro compounds. Nitriles and isonitriles. • Aldehydes and ketones, ketoenol tautomerism. Nucleophilic addition to a carbonyl group. Oxidation and reduction of aldehydes and ketones. Halogenation and alkylation, aldol reaction. • Carboxylic acids and their derivatives, nucleophilic substitution at the acyl carbon atom. • Esters, Claisen condensation, halogenation and alkylation. Amides and their reactions. Polar and coordination organometallic compounds and their reactions. • Reaction selectivity: chemo-, regio- and stereoselectivity. • Elements of organic synthesis strategy. • Protecting groups, retrosynthetic analysis. • Selected issues of chemistry of natural products.
Learning outcomes:	- Student has a structured knowledge of organic chemistry, including

	techniques and methods for the identification of organic preparations and the characterization of chemical and biochemical substances. - Student is able to develop documentation regarding the implementation of an engineering task and prepare a text containing a discussion of the results of this task. - Student has the ability to self-educate, e.g. in order to improve professional competences. - Student is able to operate the basic devices used in the techniques of engineering materials production. - Student is able to use modern methods of testing and shaping the mechanical and functional properties of engineering materials. - Student is able to analyze and control the parameters of manufacturing processes using modern measurement techniques. - Student applies the rules of occupational health and safety. - Student understands the need and knows the possibilities of continuous training (second and third degree studies, postgraduate studies, courses) - improving professional, personal and social competences. - Student is aware of the responsibility for their own work and is ready to comply with the rules of teamwork and take responsibility for jointly implemented tasks.
Name of lecturer:	Prof. Joanna Paciorek-Sadowska Dr. Eng. Marcin Borowicz Marek Isbrandt, MSc
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