

Therapeutic oligonucleotide analogues
SYLLABUS

Item name	Therapeutic oligonucleotide analogues
Name of the unit offering the course	Institute of Bioorganic Chemistry of the Polish Academy of Sciences in Poznań
Language of instruction	Polish/English
Learning outcomes for the course, categorized into: knowledge, skills, and social competences.	The doctoral student: 1. Learns the pathway from concept to drug. 2. Acquires advanced subject-specific and methodological knowledge regarding the chemistry of nucleic acid components. 3. Learns the chemistry, methods, and analytical techniques used in the synthesis of oligonucleotide analogues. 4. Upon completion of the course, the doctoral student should be able to: (i) develop a selection concept and synthesis strategy for an oligonucleotide analogue; (ii) independently select a synthesis method for the target oligonucleotide analogue; (iii) define, to a limited extent, the research and application objectives for oligonucleotide analogues; (iv) evaluate the economic aspects of the planned synthetic approach; and (v) critically evaluate literature reports concerning the chemistry and properties of selected oligonucleotide analogues.
Learning outcomes, according to Attachment 2 to the Programme of the Study (valid from October 1 st 2026)	P8S_WG (pkt. 1,2) P8S_UW (pkt. 1,2), P8S_UU (pkt 1), P8_UO pkt 3, P8S_UW (pkt 2), P8S_KK (pkt 3), P8S_UK (pkt 3)
Item type	Specialized lecture course
Semester/Year	Summer Semester 2026/2027
Name(s) of the course instructor(s)	Prof. dr hab. Adam Kraszewski
Name(s) of the examiner(s) or the person granting course credit, if other than the course instructor.	Prof. dr hab. Adam Kraszewski
Method of implementation	Lecture using audiovisual aids
Prerequisites and additional requirements	Knowledge of organic chemistry at the university level and basic knowledge of the structure and function of nucleic acids.
Number of ECTS credits assigned to the course	2 ECTS
ECTS credits breakdown	One ECTS point corresponds to 6 hours of lectures and 4 hours of the doctoral student's individual work dedicated to mastering the material presented during the lectures (see source texts).

Teaching methods employed	Lectures utilizing modern audiovisual techniques, followed by a discussion.
Methods for verifying and assessing learning outcomes achieved by doctoral students	Written exam; individual discussion of exam results.
Form and conditions for passing the course	Passing grade on the exam.
Course content	1. DNA vs. RNA structure – requirements for chemical synthesis approaches. 2. Concepts and types of protecting group systems for nucleosides and nucleotides used in oligonucleotide synthesis. 3. Nucleoside analogues targeting therapeutic sites and methods for their synthesis. 4. Methods for synthesizing oligonucleotide analogues. 5. Selected methods and mechanisms for modifying internucleotide phosphoester linkages. 6. Selected non-therapeutic oligonucleotide analogues – synthesis and properties.
List of basic and supplementary literature	• <i>Oligonucleotide synthesis: a practical approach</i>. M. Gait (red.). Oxford: Oxford University Press, 1984. • <i>Oligonucleotides and Analogues. A Practical Approach</i>. F. Eckstein (red.). Oxford: Oxford University Press, 1991. • <i>Protocols for Oligonucleotides and Analogs. Synthesis and Properties</i>. S. Agrawal (red.). Totowa: Humana Press, 1993. • <i>Protocols for Oligonucleotide Conjugates. Synthesis and Analytical Techniques</i>. S. Agrawal (red.). Totowa: Humana Press, 1994.