


**KAPITAŁ LUDZKI**  
 NARODOWA STRATEGIA SPÓJNOŚCI

 Projekt współfinansowany przez  
 Unię Europejską w ramach  
 Europejskiego Funduszu  
 Społecznego

**UNIA EUROPEJSKA**  
 EUROPEJSKI  
 FUNDUSZ SPOŁECZNY


<b>Course title</b>		<b>ECTS code</b>	
Graduate study lecture - Innovative metallopharmaceuticals in diagnostics and treatments		13.3.0941	
<b>Name of unit administrating study</b>			
null			
<b>Studies</b>			
<b>faculty</b>	<b>field of study</b>	<b>type</b>	drugiego stopnia
Wydział Chemii	Chemia	<b>form</b>	stacjonarne
		<b>specjalty</b>	chemia biomedyczna, analityka i diagnostyka chemiczna, chemia i technologia środowiska, chemia obliczeniowa
		<b>specialization</b>	wszystkie
<b>Teaching staff</b>			
prof. UG, dr hab. Agnieszka Chylewska			
<b>Forms of classes, the realization and number of hours</b>		<b>ECTS credits</b>	
<b>Forms of classes</b>		3	
Lecture		classes - 30 h	
<b>The realization of activities</b>		tutorial classes – 10 h	
classroom instruction		student's own work – 35 h	
<b>Number of hours</b>		Total: 75 h - 3 ECTS	
Lecture: 30 hours			
<b>The academic cycle</b>			
2022/2023 summer semester			
<b>Type of course</b>		<b>Language of instruction</b>	
obligatory		polish	
<b>Teaching methods</b>		<b>Form and method of assessment and basic criteria for evaluation or examination requirements</b>	
- discussion - multimedia-based lecture		<b>Final evaluation</b>	
		Graded credit	
		<b>Assessment methods</b>	
		written exam with open and closed questions regarding the subject of the lecture	
		<b>The basic criteria for evaluation</b>	
		Passing the lecture on the basis of obtaining a positive mark from the written test consisting of closed questions (single choice test) and open ones in a 1: 1 ratio covering the issues mentioned in the lecture's program content; We reserve the right to ask open-ended questions justifying the selection of responses to closed questions. The applied rating scale complies with the regulations at UG.	
<b>Method of verifying required learning outcomes</b>			
<b>Required courses and introductory requirements</b>			
<b>A. Formal requirements</b>			
none			
<b>B. Prerequisites</b>			
none			
<b>Aims of education</b>			
- acquainting with the basic factors determining the biological activity of the metallopharmaceutical - developing the ability to combine knowledge from the area of chemistry and medicine with regard to the practice of drugs based on metal ion complexes			

<p>- familiarizing with examples of metalolics used in our life</p> <p>- introduction to the basics of designing and obtaining metallopharmaceuticals from the last 15 years</p>	
<p><b>Course contents</b></p> <p>characteristics of metallopharmaceuticals and their possible physiological effects; systematisation and discussion of factors determining metallolecular activity (hydrophilic-lipophilic nature, central ion oxidation state, degree of ionization, particle size, kinetic and thermodynamic stability); characterization of metallopharmaceuticals properties that are important for their use in medical diagnosis and treatment; discussion of the method of designing the structure and conditions for the synthesis of metallopharmaceuticals; classification of metal-drugs and prodrugs due to the structure: type of ionic metallic center, type of ligand(s), geometry, coordination number; presentation of examples of anticancer drugs based on metal ion complexes with particular attention on single- and multi-core ion complexes with the oxidation states (a) + I: gold; (b) + II: cobalt, ruthenium, rhodium, osmium, copper, palladium, platinum, molybdenum; (c) + III: cobalt, ruthenium, rhodium, osmium, iridium, gold; (d) + IV: platinum, molybdenum; mechanisms of metallodrugs action and their cellular targets; metal complexes used in practice as anti-inflammatory drugs; metallopharmaceuticals in medical diagnostics (radiopharmaceuticals, contrast agents, metal-radiosensitive compounds, metal-systems with antiviral, antibacterial and antifungal activities).</p>	
<p><b>Bibliography of literature</b></p> <p>Literature required to pass the course</p> <ol style="list-style-type: none"> <li>1. „Metallopharmaceuticals in Therapy – a New Horizon for Scientific Research”, <i>Curr. Med. Chem.</i>, 25: 1729-1791, 2018.</li> <li>2. „Metal complexes in cancer therapy – an update from drug design perspective”, <i>Drug Des. Devel. Ther.</i> 11: 599-616, 2017.</li> <li>3. „Molybdenum Metallopharmaceuticals Candidate Compounds – The “Ranaissance” of Molybdenum Metallodrugs?”, <i>Curr. Med. Chem.</i>, 23: 3322-3342, 2016.</li> <li>4. “Ruthenium metallopharmaceuticals”, <i>Coord. Chem. Rev.</i> 232: 69-93, 2002.</li> <li>5. “Copper Complexes as Anticancer Agents”, <i>Anti-Cancer Agents Med. Chem.</i> 9: 185-211, 2009.</li> <li>6. “Dicarba-closo-dodecarborane-containing half-sandwich complexes of ruthenium, osmium, rhodium and iridium: biological relevance and synthetic strategies”, <i>Chem. Soc. Rev.</i>, 41: 3264-3279, 2012.</li> <li>7. “Ruthenium (II/III)-Based Compounds with Encouraging Antiproliferative Activity against Non-small-Cell Lung Cancer.” <i>Chem. Eur. J.</i> 2012, 18, 14464-14472, 2012.</li> <li>8. “Advances in cobalt complexes as anticancer agents”, <i>Dalton Trans.</i> 44: 13796-13808, 2015.</li> <li>9. “Effects of NAMI-A and some related ruthenium complexes on cell viability after short exposure of tumor cells”, <i>Anti-cancer Drugs</i>, 11: 665-672, 2000.</li> <li>10. “Thioamido coordination in a thioxo-1,2,4-triazole copper(II) complex enhances nonapoptotic programmed cell death associated with copper accumulation and oxidative stress in human cancer cells”, <i>J. Med. Chem.</i> 50: 1916-1924, 2007.</li> <li>11. M. Cieślak-Golonka, J. Starosta, M. Wasielewski, “Wstęp do chemii koordynacyjnej” PWN, 2010.</li> </ol>	
<p><b>The learning outcomes (for the field of study and specialization)</b></p>	<p><b>Knowledge</b></p> <p>The Student:</p> <ol style="list-style-type: none"> <li>1. knows and recognizes metallopharmaceutics</li> <li>2. knows how to design the metallopharmacutics structure</li> <li>3. understands how to plan the synthesis</li> <li>4. understands and can explain the importance of factors affecting the biological activity of metal ion complexes</li> <li>5. uses terminology related to the naming of metallopharmaceuticals and their construction</li> <li>6. gives specific examples of metallopharmaceuticals used in practice as: anti-cancer, anti-inflammatory, antimicrobial and used in medical diagnostics</li> <li>7. correctly identifies types of metallopharmaceuticals</li> </ol>
	<p><b>Skills</b></p>
	<p><b>Social competence</b></p> <p>The Student understands the importance of metallopharmaceuticals in human life, including: medical diagnosis and treatment of diseases</p>
<p><b>Contact</b></p> <p>agnieszka.chylewska!@ug.edu.pl</p>	