Translational Medicine and Advanced Biomedical Methods
Medycyna translacyjna i nowoczesne metody biomedyczne.

1. IMPRINT

Academic Year	2025/2026
Department	Faculty of Medicine
Field of study	Medicine
Main scientific discipline	Medical sciences
Study Profile	General academic
Level of studies	Uniform MSc
Form of studies	Full time studies
Type of module / course	Non-compulsory (optional)
Form of verification of learning outcomes	Completion
Educational Unit / Educational Units	Department of Regenerative Medicine MUW – 2W10 CePT 1b Banacha St., 02-097 Warsaw Ph: 48 22 116 61 05, e-mail: medycyna.regeneracyjna@wum.edu.pl
Head of Educational Unit / Heads of Educational Units	Prof. dr hab. n. med. Magdalena Kucia
Course coordinator	Dr n. med. Agnieszka Łukomska, e-mail: agnieszka.lukomska@wum.edu.pl Phone: 22 116 61 09
Person responsible for syllabus	Dr n. med. Agnieszka Łukomska, e-mail: agnieszka.lukomska@wum.edu.pl Phone: 22 116 61 09
Teachers	prof. dr hab. n. med. Magdalena Kucia, prof. dr hab. n. med. Mariusz Ratajczak, dr n. med. Agnieszka Łukomska, dr Justyna Jarczak, dr n. med. Diana Wierzbicka, dr Michalina Kazek, dr Emilia Waraksa-Zasada, mgr Patrycja Kieszek

2. BASIC INFORMATION

Year and semester of studies	III-IV year, summer, and winter semester	**Number of ECTS credits**	2.00
FORMS OF CLASSES			

Contacting hours with academic teacher	Number of hours	ECTS credits calculation
Lecture (L)		
Seminar (S)	30 (on-site and e-learning)	1.20
Classes (C)		
e-learning (e-L)		
Practical classes (PC)		
Work placement (WP)		
Unassisted student's work		
Preparation for classes and completions	20	0.80

3. COURSE OBJECTIVES

O1	**Introduction to the paradigm and tools of translational medicine.** To familiarize students with the key concepts of the "bench-to-bedside" process and the advanced biomedical technologies (including -omics techniques, cytometry, and 3D cultures) utilized in modern diagnostics and therapy.
O2	**Development of skills in critical scientific analysis.** To train students in evaluating and interpreting data from scientific publications, which forms the foundation of Evidence-Based Medicine (EBM), and to provide a practical introduction to selected research methodologies through workshops.
O3	**Identification and fostering of scientific talent.** To inspire students towards scientific development and create a selection platform for individuals with high research potential, aiming for their future integration into projects carried out by research teams at the Medical University of Warsaw (MUW) and CePT.

4. STANDARDS OF LEARNING – DETAILED DESCRIPTION OF EFFECTS OF LEARNING

Code and number of the effect of learning in accordance with standards of learning	Effects in the field of: *(in accordance with appendix to the Regulation of Minister of Science and Higher education from 26th of July 2019)*
Knowledge – Graduate* knows and understands:	
B.W14.	functions of the genome, transcriptome and human proteome and the basic methods used in their study; processes of replication, repair and recombination of DNA, transcription and translation and degradation of DNA, RNA and proteins; knows the concepts of the gene expression regulation
B.W29.	how to perform scientific, observational and experimental research, as well as in vitro tests the purpose of which is the development of medicine.
C.W42.	basic directions of therapy development, in particular the possibility of cell therapy and gene therapy in specific diseases

D.W23.	foundations of evidence based medicine.
Skills– Graduate* is able to:	
B.U12	explain the differences between prospective and retrospective study, randomised and clinical and case-control studies, descriptions of cases and experimental research, as well as arrange them according to their credibility and quality of scientific evidence
B.U13.	plan simple research and interpret the results and draw conclusions
D.U17.	critically analyse the medical bibliography (also in English) and draw conclusions

** In appendix to the Regulation of Minister of Science and Higher education from 26th of July 2019 „graduate", not student is mentioned.*

5. ADDITIONAL EFFECTS OF LEARNING *(non-compulsory)*

Number of effect of learning	**Effects in the fields of:**
Knowledge – Graduate knows and understands:	
K1	The basic stages and challenges associated with the process of research commercialization and technology transfer in biomedicine.
K2	The potential applications and limitations of artificial intelligence (AI) in medical data analysis and therapy design.
Skills– Graduate is able to:	
S1	Integrate knowledge from various fields of basic sciences to analyze and propose a solution to a translational problem (case study).
S2	Present the assumptions of a simple translational scientific project in a concise and structured manner.
Social Competencies – Graduate is ready for:	
SC1	Use objective sources of information (1.3. item 7).
SC2	Formulate conclusions based on one's own measurements or observations (1.3. item 8).
SC3	Implement the principles of professional collegiality and cooperation within a team of specialists (...) (1.3. item 9).

6. CLASSES

Form of class	**Class contents**	**Effects of Learning**
Seminar	From Bench to Bedside: What is Translational Medicine?	B.W29.
	The Drug Development Pipeline: From Concept to Clinic.	B.W29., D.W23.
	Next-Generation Genomics and Transcriptomics.	B.W14.
	Proteomics: In Search of Molecular Machines and Biomarkers.	B.W14.
	Metabolomics: The Metabolic Fingerprint of Diseases.	B.W14.
	Cell Cultures as Disease Models (2D, 3D, and Organoids).	B.W29., C.W42.
	Flow Cytometry: Theory and its Revolution in Diagnostics.	B.W29.

	Workshop: Demonstration in the Regenerative Medicine Laboratories.	B.U13., SC2
	The Role of Animal Models and CRISPR/Cas9 Technology in Medicine.	B.W29., C.W42.
	Workshop: How to Critically Appraise Scientific Publications Based on EBM Principles.	D.W23., B.U12., D.U17., SC1
	Technology Transfer and Research Commercialization: From Discovery to Startup.	K1
	The Role of Artificial Intelligence (AI) and Big Data in Translational Medicine.	K2, SC1
	Case Study: A Biomarker's Journey from Discovery to Diagnostic Test.	S1, SC2, SC3
	Student Presentations: Translational Mini-Projects.	S2, B.U13., SC3
	The Physician-Scientist: How to Begin Your Journey in Research.	B.W29., B.U13.

7. LITERATURE

Obligatory

1. **Course materials** provided by the instructors.
2. Wehling, M. (2021). *Principles of Translational Science in Medicine: From Bench to Bedside* (2nd ed.). Academic Press.

Supplementary

Hanna, J., & Hubbi, M. E. (2023). Organoids: Opportunities and challenges for translational medicine. Nature Reviews Molecular Cell Biology, 24(5), 285–302.

Sams-Dodd, F. (2020). Strategies to overcome translational challenges: the future of biomarker-guided drug development. Drug Discovery Today, 25(10), 1817–1825.

Li, M., & Izpisua Belmonte, J. C. (2022). Stem cell aging: mechanisms, regulators and rejuvenation. Nature Reviews Molecular Cell Biology, 23(8), 553–571.

Trounson, A., & McDonald, C. (2019). Stem cell therapies in clinical trials: progress and challenges. Cell Stem Cell, 27(4), 507–518.

Medical Research Agency (ABM). (2022). Guidelines for non-commercial and translational research. Warsaw.

8. VERIFYING THE EFFECT OF LEARNING

Code of the course effect of learning	Ways of verifying the effect of learning	Completion criterion
B.W14, B.W29, C.W42, D.W23, K1, K2, B.U12, D.U17, SC1, SC2, SC3, S1	**Active participation in classes (40% of the final grade):** Assessment of the substantive contribution to seminar discussions and engagement in group work during workshops, particularly during the Case Study analysis.	Obtaining a minimum of 60% of the points available for activity throughout the semester.
B.U13, S2, SC3	**Final presentation (60% of the final grade):**Preparation and delivery of a group presentation on a selected topic within translational medicine (mini-project).	Obtaining a minimum of 60% of the points from the presentation, assessed on its substantive content, structure, and the manner of presenting conclusions.

9. ADDITIONAL INFORMATION

Classes are conducted in a hybrid format, meaning that some seminars and workshops are held in-person while others are conducted remotely (online). Due to the interactive nature of the classes, the group size is limited to 30 students. Detailed dates and locations for the in-person classes will be provided in the schedule at the beginning of the semester.

The condition for passing the course is to obtain a total of at least 60% of the points from the sum of both verification methods (activity + presentation) and to maintain attendance. One absence is permitted and must be made up in a form agreed upon with the instructor. The student is entitled to three assessment attempts. In the event of failing to reach the 60% threshold, retake assessments will be conducted as a written test covering the entire course material.

This elective course is strongly linked to research activities and aims to identify students with scientific potential. The most active participants will have the opportunity to join research projects. The Student Scientific Club of Regenerative Medicine operates within the department. We invite all students interested in scientific work and development in this field to join.
Club Supervisor: Agnieszka Łukomska, MD, PhD, Contact: agnieszka.lukomska@wum.edu.pl

ATTENTION

The final 10 minutes of the last class in the block/semester/year should be allocated to students' Survey of Evaluation of Classes and Academic Teachers.