Course unit English denomination	Clinical Application of Artificial Intelligence
SS	MEDS-20/A
Teacher in charge (if defined)	Raffaella Colombatti
Teaching Hours	2
Number of ECTS credits allocated	0,33
Course period	January 2026
Course delivery method	☒ In presence ☐ Remotely ☐ Blended
Language of instruction	English
Mandatory attendance	☒ Yes (80% minimum of presence) ☐ No
Course unit contents	The seminar will focus on the challenges and opportunities related to the application of Artificial Intelligence (AI) in the clinical field. During the course, concrete examples of AI use in various medical contexts will be presented, with particular attention to clinical problems and unmet needs that AI is helping to address or offering new perspectives on. Use cases in complex areas such as rare diseases, hematological conditions, and oncology will be illustrated, highlighting how AI supports clinical decision-making, improves diagnostic accuracy, and optimizes the management of clinical trials. The seminar will also offer a critical reflection on the role of the physician and clinical researcher within multidisciplinary teams, where collaboration among AI experts, technicians, bioinformaticians, and clinicians is essential for developing effective, ethical, and practically applicable solutions in healthcare.

Learning goals	- Gain knowledge of real-world examples of AI applications in medicine. - Understand the central role of physicians and clinical researchers in problem definition, model validation, and interpretation of AI-generated results. - Develop critical awareness of the potential and limitations of AI in clinical settings. - Promote an integrated and collaborative vision of multidisciplinary teamwork, which is essential for the success of digital innovation projects in healthcare.
Teaching methods	Presentation from teachers with different expertise and discussion
Course on transversal, interdisciplinary, transdisciplinary skills	☒ Yes ☐ No
Available for PhD students from other courses	☐ Yes ☒ No
Prerequisites (not mandatory)	No
Examination methods (in applicable)	No
Suggested readings	
Additional information	

Course unit English denomination	Bioetics in pediatric age
SS	MEDS-25/A
Teacher in charge (if defined)	Anna Aprile
Teaching Hours	2
Number of ECTS credits allocated	0.33
Course period	15/01/2026
Course delivery method	☒ In presence ☐ Remotely ☐ Blended
Language of instruction	Italian
Mandatory attendance	☒ Yes (80% minimum of presence) ☐ No
Course unit contents	The pediatric bioethics seminar aims to explore the specific ethical issues that arise in the care and research involving minor patients. Topics will include informed consent, the vulnerability of children, shared decision-making between families and healthcare professionals, and the implications of new technologies in pediatric settings. Through case studies and interactive discussions, participants will have the opportunity to analyze ethical dilemmas and current regulations, deepening their understanding of the ethical dimensions of clinical choices.
Learning goals	The primary objective of the course is to equip participants with the knowledge and tools necessary to address bioethical challenges in pediatric practice. By the end of the seminar, participants will be able to recognize and evaluate the specific ethical issues related to care and research in pediatric populations, developing skills to

	apply ethical principles in their daily decision-making. Additionally, the seminar aims to foster critical reflection and constructive dialogue among healthcare professionals, families, and researchers.
Teaching methods	Seminar with slides
Course on transversal, interdisciplinary, transdisciplinary skills	☐ Yes ☒ No
Available for PhD students from other courses	☐ Yes ☒ No
Prerequisites (not mandatory)	None
Examination methods (in applicable)	No
Suggested readings	
Additional information	

Course unit English denomination	Fundamentals of "Practical" Epidemiology and Population and Big data
SS	MEDS-24/B
Teacher in charge (if defined)	Prof. Vincenzo Baldo
Teaching Hours	4
Number of ECTS credits allocated	0.66
Course period	April 2026
Course delivery method	☒ In presence ☐ Remotely ☐ Blended
Language of instruction	Italian
Mandatory attendance	☒ Yes (80% minimum of presence) ☐ No
Course unit contents	The epidemiology course will focus on the use of health data and will emphasize the importance of data in studying the distribution and determinants of diseases within the population. The variety of available data sources will be explored, such as disease registries, administrative and clinical data, and data from health surveillance systems. A key aspect will concern data management, including data collection, storage, and protection, with particular attention to privacy and security. The course will also address data analysis, using statistical methods to interpret trends and develop predictive models. Finally, emphasis will be placed on data quality, assessing accuracy and completeness, and on practical applications, such as health surveillance and planning preventive interventions.

Learning goals	• Understand the basic principles of epidemiology: learn the fundamental concepts of incidence, prevalence, and relative risk. • Explore different types of epidemiological studies: distinguish between descriptive, analytical, and experimental studies. • Identify and evaluate the main sources of health data: including disease registries, clinical, and administrative data. • Learn techniques for data collection and management: implement strategies for accurate data collection and management in healthcare settings. • Develop skills in health data analysis: use statistical software to process and interpret epidemiological data. • Assess the quality of health data: identify issues of accuracy, completeness, and bias in data. • Apply appropriate statistical methods: conduct analyses such as logistic regression, hypothesis testing, and survival analysis. • Interpret epidemiological results for public health action: translate data into strategies for disease prevention and control. • Design public health interventions based on data: plan and evaluate prevention or disease management interventions based on epidemiological evidence. • Evaluate the impact of health policies through data: measure the effectiveness of public health policies using data analysis.
Teaching methods	Seminars with slides
Course on transversal, interdisciplinary, transdisciplinary skills	☒ Yes ☐ No
Available for PhD students from other courses	☐ Yes ☒ No
Prerequisites	None

(not mandatory)	
Examination methods (in applicable)	No
Suggested readings	
Additional information	

Course unit English denomination	Statistics, Machine Learning -Practical Artificial Intelligence for Medical Data Analyses
SS	ND
Teacher in charge	C. Lanera, G. Lorenzoni, L. Vedovelli
Teaching Hours	24
Number of ECTS credits allocated	6
Course period	I, II. III year: May 2026
Course delivery method	☒ In presence ☐ Remotely ☐ Blended
Language of instruction	English
Mandatory attendance	☒ Yes (80% minimum of presence) ☐ No
Course unit contents	Integrating Artificial Intelligence (AI) and Machine Learning (ML) in the rapidly evolving medical research landscape has become indispensable. This course series, spanning three years, is designed to equip Ph.D. students in medical fields with practical and advanced skillsstarting form classical statics to arrive to AI and ML, utilizing R programming language, RStudio Cloud, and other state-of-the-art AI technologies. Each course is self-contained, ensuring accessibility and immediate utility for students each year, while the cumulative knowledge and skills fostered across the series manifest a comprehensive learning journey. Year 1: (12 hours, 2 CFU) introducing R/RStudio (Cloud) alongside basic Machine Learning Techniques (MLT), including regression, classification, survival analysis, cross-validation, and performance metrics. We delve into shallow models such as k-nearest neighbors

	(k-NN), support vector machines (SVM), random forests (rf), and XGBoost, ensuring robust groundwork Year 2: (6 hours, 1 CFU) Large Language Models (LLM), including ChatGPT and OpenAI's R-API, allow students to appreciate and engage with the nuances of AI's linguistic capabilities, particularly in medical data interpretation and analysis. Year 3: (6 hours, 1 CFU) TensorFlow/Keras and personalized Deep Learning (DL) fundamentals. This advanced course offers students hands-on experience in cutting-edge DL techniques for medical data analysis, focusing on understanding the DL jargon and building blocks. This segment also completes the individual's learning curve and ensures they are well-equipped to tackle complex, real-world medical data challenges using AI and ML
Learning goals	• Increase your knowledge of the use of artificial intelligence and machine learning in medical research • • Learn basic machine learning techniques • • Understand how large language models interpret and analyze medical data • • Experiment with deep learning techniques
Teaching methods	Seminar with slides
Course on transversal, interdisciplinary, transdisciplinary skills	☒ Yes ☐ No
Available for PhD students from other courses	☒ Yes ☐ No
Prerequisites (not mandatory)	None
Examination methods (in applicable)	No

Suggested readings	
Additional information	This course is organized in collaboration with the Doctoral Course in Translational Specialist Medicine "G.B. Morgagni". Transversal course not attributable to any SS.

Course unit English denomination	Omics and Basic Sciences
SS	MEDS-01/A, CHEM-07/A, BIOS-10/A
Teacher in charge (if defined)	Prof. Matteo Cassina, Prof. Giampietro Viola, Prof.ssa Michela Pozzobon
Teaching Hours	6
Number of ECTS credits allocated	1
Course period	5,12,19.03.2026
Course delivery method	☒ In presence ☐ Remotely ☐ Blended
Language of instruction	Italian
Mandatory attendance	☒ Yes (80% minimum of presence) ☐ No
Course unit contents	The course will introduce PhD students to the emerging field of omics sciences, encompassing various disciplines such as genomics, transcriptomics, proteomics, and metabolomics. The course will provide an overview of omics technologies, data analysis methods, and their applications in biological and medical research. In addition, fundamental concepts in biology and other disciplines will be covered, focusing on those relevant to the development, progression, and treatment of cancer and genetic diseases
Learning goals	- To learn principles, history, and technologies of omics sciences. - To provide an understanding of omics data generation and analysis (DNA sequencing, next-generation sequencing technologies; genome annotation and analysis; gene expression

	analysis and RNA sequencing; transcriptome profiling methods; multi-omics data integration) - To explore the applications of omics technologies in basic research, clinical diagnostics, and personalized medicine. - To discuss ethical considerations and challenges in omics research. - To explore basic principles of biology, genetics, pharmacology, and regenerative medicine relevant to cancer and genetic diseases. - To learn examples of basic approaches for developing innovative treatments of pediatric oncological and genetic diseases.
Teaching methods	Series of seminar with slides
Course on transversal, interdisciplinary, transdisciplinary skills	☐ Yes ☒ No
Available for PhD students from other courses	☐ Yes ☒ No
Prerequisites (not mandatory)	None
Examination methods (in applicable)	No
Suggested readings	
Additional information	

Course unit English denomination	Grant Writing
SS	ND
Teacher in charge	Martina Pigazzi
Teaching Hours	6
Number of ECTS credits allocated	1
Course period	13.11.2025 e 20.11.2025
Course delivery method	☒ In presence ☐ Remotely ☐ Blended
Language of instruction	Italian
Mandatory attendance	☒ Yes (% minimum of presence) ☐ No
Course unit contents	Grant Writing course would explain how to create grant applications or how to improve the quality of grant applications. he course will help to know better the funder agencies, how to align research questions with objectives and how to use correct narrative tools across the grant application to make it informative and persuasive.
Learning goals	• Understand the different types of grants available. • Learn how to select the most suitable grant opportunities based on your organization and your research. • elucidate the key components of a grant proposal. • Distinguish Background from state of the art. • Learn to identify the hypothesis from the objectives.

	• Acquire the ability to write a compelling grant narrative and avoid common mistakes. • Identify and understand the various % of a grant budget. • identify human resources. • Learn how to justify the budget. • Distinguish between letters of support and letters of collaboration. • Learn how to develop the feasibility paragraph. • How to use and construct preliminary data. • Develop and extrapolate the impact of the grant in the field. • List and summarize expected results. • Develop pitfalls and caveats to sustain a contingency plan. • Delineate your narrative biographical sketch.
Teaching methods	Seminar with slides
Course on transversal, interdisciplinary, transdisciplinary skills	☒ Yes ☐ No
Available for PhD students from other courses	☐ Yes ☒ No
Prerequisites (not mandatory)	None
Examination methods (in applicable)	No
Suggested readings	
Additional information	Transversal course not attributable to any specific SS.

Course unit English denomination	Use of bibliographic resources
SS	ND
Teacher in charge (if defined)	M. Cassina
Teaching Hours	4
Number of ECTS credits allocated	0.66
Course period	December 2025
Course delivery method	☒ In presence ☐ Remotely ☐ Blended
Language of instruction	Italian
Mandatory attendance	☒ Yes (80 % minimum of presence) ☐ No
Course unit contents	First lesson (5 .12. 2024): - digital magazines and ebooks - supply of documents - PubMed - Zotero Second lesson (12 .12 2024): - the Scopus and Web of Science citation databases - Journal of Citation Reports - bibliometric indicators - Open Science

	- Institutional archives
Learning goals	• Know the resources to support research made available by the Pinali Library • Learn to use the programs available • Increase your ability to carry out bibliographic searches and find useful resources for research • Understand how bibliometric indicators work
Teaching methods	Seminar with slides support
Course on transversal, interdisciplinary, transdisciplinary skills	☒ Yes ☐ No
Available for PhD students from other courses	☐ Yes ☒ No
Prerequisites (not mandatory)	None
Examination methods (in applicable)	No
Suggested readings	
Additional information	This course is organized in collaboration with the Doctoral Course in “Translational Specialist Medicine "G.B. Morgagni". Transversal course not attributable to any specific SS.

Course unit English denomination	Current Topics in Biomedical and Pediatric Research Seminars
SS	ND
Teacher in charge (if defined)	Gianni Bisogno
Teaching Hours	6
Number of ECTS credits allocated	1
Course period	I, II and III year
Course delivery method	☒ In presence ☐ Remotely ☐ Blended
Language of instruction	Italian
Mandatory attendance	☒ Yes (80% minimum of presence) ☐ No
Course unit contents	A seminar series designed to provide PhD students with an opportunity to engage in discussions on current topics that influence scientific research, clinical practice, and health policies. The topics will be updated annually based on developments in scientific literature, emerging technologies, and global challenges affecting health and human development. Through the presentation of a current topic by an expert, the aim is to foster a critical discussion with PhD students. They will be encouraged to propose topics, moderate sessions, and present brief insights.
Learning goals	Critically analyze scientific articles and data on current topics.

	Integrate multidisciplinary knowledge to understand the global context of scientific innovations. Evaluate the ethical and social impact of new discoveries in the biomedical and pediatric fields. Actively participate in scientific debate with evidence-based arguments.
Teaching methods	Seminars with slides
Course on transversal, interdisciplinary, transdisciplinary skills	☒ Yes ☐ No
Available for PhD students from other courses	☐ Yes ☒ No
Prerequisites (not mandatory)	None
Examination methods (in applicable)	No
Suggested readings	
Additional information	SS not applicable to lectures with a seminar character.

Course unit English denomination	Advanced laboratory technologies
SS	MEDS-20/A
Responsable	Barbara Buldini
Teacher in charge (if defined)	Silvia Bresolin, Giuseppe Germano, Chiara Frasson, Elena Varotto, Giulia Gomiero
Teaching Hours	6
Number of ECTS credits allocated	1
Course period	26.3.2026 e 21.5.2026
Course delivery method	☒ In presence ☐ Remotely ☐ Blended
Language of instruction	Italian
Mandatory attendance	☒ Yes (80% minimum of presence) ☐ No
Course unit contents	The course aims to deepen the most recent laboratory technologies, which are the gold standard in advanced diagnostics, particularly in pediatric oncohematology. These methodological approaches are applied in clinical, translational, and basic research settings. During the course, Next Generation Sequencing (NGS) will be discussed as a method for identifying Ig/TR clonality markers (VDJ rearrangements) for the analysis of Minimal Residual Disease, which is fundamental in assessing treatment response in Acute Lymphoblastic Leukemia. Additionally, cutting-edge technologies based on single-cell analysis of the genome, transcriptome, chromatin conformation,

	and V(D)J rearrangements will be described for the identification and characterization of cellular subpopulations, introducing potential diagnostic applications. The program also includes an introduction to Multicolor Flow Cytometry, a complex technology that enables rapid, detailed, and accurate characterization of cell populations from various types of biological samples in suspension, as well as a theoretical explanation of the basics of Flow Cytometry, biological sample preparation, and the correct use of reagents. Finally, the principles of cell sorting through Flow Cytometry (Fluorescence-Activated Cell Sorting, FACS) will be presented, a technology that allows the purification of cell subpopulations from a heterogeneous cell suspension. In general, the lessons will provide a theoretical deepening of the main technologies used in advanced diagnostics, followed by the presentation of clinical and translational examples and applications in the field of oncohematological diseases.
Learning goals	- Understand the main advanced technologies based on NGS methods applied in the clinical context (mutations, fusion genes, minimal residual disease) - Comprehend the approach for identifying markers usable for the assessment of minimal residual disease - Understand the single-cell approach for identifying cell subpopulations based on whole transcriptome analysis - Know the relationships between transcriptome and chromatin accessibility - Learn how to design and apply a bulk or single-cell NGS method in the context of advanced diagnostics. - Provide an overview of flow cytometry and cell sorting and their practical uses in diagnostics and research.

Teaching methods	Lectures and interaction with participants aimed at stimulating data interpretation skills
Course on transversal, interdisciplinary, transdisciplinary skills	☒ Yes ☐ No
Available for PhD students from other courses	☐ Yes ☒ No
Prerequisites (not mandatory)	None
Examination methods (in applicable)	No
Suggested readings	slides
Additional information	