

DOCTORAL STUDIES COURSE UNIT DESCRIPTION

Name of subject	Scientific Field	Faculty	Center/Institute/ Department
LHCb Methods of Data Analysis (8 ECTS credits)	Physics N 002	Faculty of physics	Institute of Photonics and Nanotechnology
Student's workload	Hours	Student's workload	Hours
Lectures		Consultations	30
Individual study	160	Seminars	10

Course annotation

Course Description

This course introduces the programming, data analysis, and result preparation tools used in the CERN LHCb experiment. The structure of the course follows the logical workflow of an analysis, covering all essential components required to design, execute, and document high-energy physics studies.

Upon successful completion of the course, the student will be able to design and implement a complete data analysis workflow, organize a well-structured project directory, manage software environments, and effectively use LHCb-specific tools and CERN computational resources.

Course Content

1. Setting up an Analysis Project.
2. Analysis Computing Environments.
3. Analysis Pipelines and Workflows.
4. LHCb-Specific Tools.
5. Analysis Reproducibility.
6. Documentation of Analysis Components.
7. CERN Computational Resources.
8. Data Visualization and Reporting.

List of literature

1. „Fundamentals of Data Visualization“, Claus O. Wilke, 2019.
2. „An Introduction to Statistical Learning“, G. James, 2013.
3. „Python for Data Analysis: Data Wrangling with pandas, NumPy, and Jupyter“, W. McKinney, 2022.
4. „Practical Statistics for High Energy Physics“, E. Gross, 2017.

Consulting teachers	Scientific degree	Pedagogical name	Main scientific works published in a scientific field in last 5 year period
Mindaugas Šarpis	Dr.	Assistant	Dr. Mindaugas Šarpis: publication list CERN-THESIS-2023-345

Certified during Doctoral Committee session 17/09/2025, protocol No. (7.17 E) 15600-KT-445

Committee Chairman prof. S. Juršėnas