UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO

POLITECNICO DI BARI

Dipartimento Interateneo di Fisica "Michelangelo Merlin"

General information		
Academic subject	***PHYSICS LABORATORY I***	
Degree course	*PHYSICS*	
Academic Year	*I*	
European Credit Transfer and Accumulation System (ECTS)	8	
Language	*ITALIAN*	
Academic calendar (starting and ending date)	*2nd semester (March – June)*	
Attendance	*COMPULSORY ATTENDANCE*	

Professor/ Lecturer	
Name and Surname	Marilisa De Serio
E-mail	Marilisa.Deserio@uniba.it
Telephone	0805443182
Department and address	*Dipartimento Interateneo di Fisica M. Merlin, stanza 117*
Virtual headquarters	*Microsoft Teams code: pk3cvkw*
Tutoring (time and day)	Students are invited to send an e-mail to arrange individual or group meetings.

Syllabus	
Learning Objectives	*Introduction to experimental physics. Introduction to statistical analysis of experimental data.*
Course prerequisites	*Basic knowledge of mathematics. Basic knowledge of mechanics.*
Contents	***Introduction to experimental physics**:* *Scientific method. Fundamental and derived physical quantities, units of measurement. Direct and indirect measurements. Measuring instruments. Measurement errors: random and systematic errors. Comparing values of physical quantities. Comparing measured and expected values. Absolute and relative errors. Significant figures. Representation of experimental data, frequency histogram. Mean and standard deviation. Maximum and probable errors. Error propagation for derived quantities.* ***Introduction to theory of probability and statistics**:* *Law of total probability. Joint probability. Bayes' theorem. Random variables: discrete and continuous variables. Distribution function. Probability density function. Mean and variance for continuous random variables.* *Binomial distribution. Poisson distribution. Gauss distribution, standard Gaussian variable. Central limit theorem. Probabilistic interpretation of the standard deviation. Confidence intervals. Chauvenet's criterion. Parameter estimation. Principle of Maximum Likelihood. Weighted average. Least Squares method. Weighted Least Squares method. Student's T distribution. Chi-squared distribution. Chi-squared test.* *Covariance and correlation between variables.* ***Laboratory** experiments on mechanics.*
Books and bibliography	*- G. Cannelli - Metodologie sperimentali in Fisica – EdiSES* *- J. R. Taylor - Introduzione all'analisi degli errorI - Zanichelli*
Additional materials	*Slides of the lectures.*

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours

UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO

Dipartimento Interateneo di Fisica "Michelangelo Merlin"

Hours			
200	*48*	*30*	*122*
ECTS			
8	*6*	*2*	

Teaching strategy	
	Lectures (with slides). Classroom exercises. Laboratory experiments.
Expected learning outcomes	
Knowledge and understanding:	○ Knowledge and understanding of error analysis and statistical data analysis methods in physics laboratory.
Applying knowledge and understanding:	○ Ability to carry out simple experiments to verify physics laws: skills in using lab equipment, in collecting and analyzing experimental data and drawing conclusions.
Soft skills	• *Making informed judgments and choices* ○ Critical thinking, skill in interpreting experimental data. • *Communicating knowledge and understanding* ○ Ability to use adequate scientific language. ○ Teamwork skills. • *Capacities to continue learning* ○ Ability to elaborate on and make connections between concepts.

Assessment and feedback	
Methods of assessment	*Laboratory reports. Written exam on error analysis, probability and statistics. Oral exam.*
Evaluation criteria	At the end of the course, the student will ○ have an adequate knowledge and understanding of the scientific method; ○ have an adequate knowledge and understanding of the statistical methods for experimental data analysis; ○ be able to apply acquired knowledge to solve basic problems on error analysis, probability and statistics; ○ be able to carry out simple experiments, analyse and interpret data; ○ be able to write a laboratory report; ○ be able to communicate effectively using adequate scientific language.
Criteria for assessment and attribution of the final mark	*Laboratory reports and written exam on error analysis, probability and statistics (50%). Oral exam (50%).*
Additional information	