

1. Record Nr.	UNINA9910503000903321
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Titolo	Physics Experiments with Arduino and Smartphones // by Giovanni Organtini
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Springer, , 2021
ISBN	3-030-65140-1
Edizione	[1st ed. 2021.]
Descrizione fisica	1 online resource (403 pages)
Collana	Undergraduate Texts in Physics, , 2510-4128
Disciplina	530.078
Soggetti	Measurement Measuring instruments Computer programming Measurement Science and Instrumentation Programming Techniques
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and indexes.
Nota di contenuto	1 Physics and Nature -- 2 Units -- 3 Uncertainties -- 4 Statistical analysis of data -- 5 Statistical distributions and their properties -- 6 Establishing a physics law -- 7 Parameters evaluation- 8 Automatic data acquisition -- 9 The Hooke's law -- 10 Pendulum -- 11 Kinematics -- 12 Free fall -- 13 Wave mechanics.
Sommario/riassunto	This book on the use of Arduino and Smartphones in physics experiments, with a focus on mechanics, introduces various techniques by way of examples. The main aim is to teach students how to take meaningful measurements and how to interpret them. Each topic is introduced by an experiment. Those at the beginning of the book are rather simple to build and analyze. As the lessons proceed, the experiments become more refined and new techniques are introduced. Rather than providing recipes to be adopted while taking measurements, the need for new concepts is raised by observing the results of an experiment. A formal justification is given only after a concept has been introduced experimentally. The discussion extends beyond the taking of measurements to their meaning in terms of physics, the importance of what is learned from the laws that are

derived, and their limits. Stress is placed on the importance of careful design of experiments as to reduce systematic errors and on good practices to avoid common mistakes. Data are always analyzed using computer software. C-like structures are introduced in teaching how to program Arduino, while data collection and analysis is done using Python. Several methods of graphical representation of data are used.

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