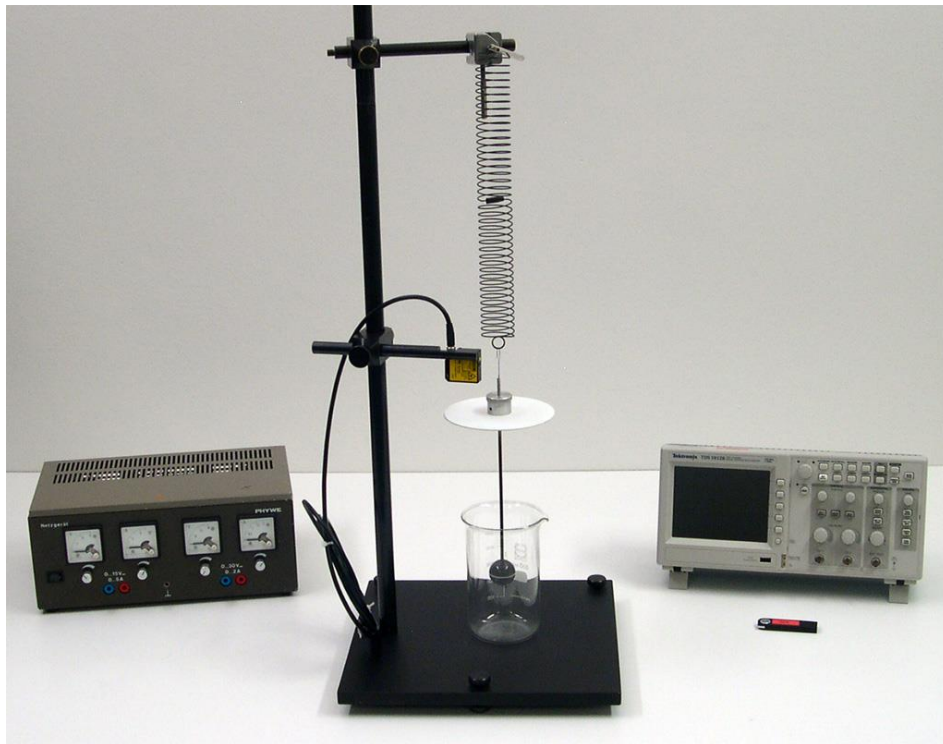


Introductory Laboratory Course Physics

Part I (Winter term)



Name:.....Course of studies:.....

The Greek alphabet

Name	Minuskel	Majuskel
Alpha	α	A
Beta	β	B
Gamma	γ	Γ
Delta	δ	Δ
Epsilon	ε	E
Zeta	ζ	Z
Eta	η	H
Theta	θ	Θ
Iota	ι	I
Kappa	κ	K
Lambda	λ	Λ
My	μ	M
Ny	ν	N
Xi	ξ	Ξ
Omikron	\omicron	O
Pi	π	Π
Rho	ρ	P
Sigma	σ	Σ
Tau	τ	T
Ypsilon	υ	Y
Phi	ϕ	Φ
Chi	χ	X
Psi	ψ	Ψ
Omega	ω	Ω

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Pictures on the title page:

Parts of experimental components for the experiment "sensors".

Top: Test components for distance measurement with a laser distance sensor.

Bottom: Test components for measuring the light intensity by means of a photodiode.

Contents

Contents	1
Succession of experiments	2
Measurement of ohmic resistances, bridge circuits, and internal resistances of voltage sources	3
Measurement of capacities – Charging and discharging of capacitors	17
Sensors for force, pressure, distance, angle and light intensity	32
Force, momentum and impulse of force	46
Data acquisition and data processing using a PC	55
Characterization of a transreceiver system	64
Conservation of momentum and energy - Law of collision	72
Viscosity and Reynolds numbers	82
Forced mechanical oscillations	94
Fourier analysis	106
Surface tension, minimal surfaces, and coffee stains	116
Moment of inertia - Steiner's theorem	125
Translation of German denotations in figures of the script	131

Succession of the experiments

Schedule	Week	Remarks	Subject
1	42		General remarks on the module <i>Introductory Laboratory Course Physics</i> , the preparation of reports, and the usage of computers. Exercises to Origin and Matlab (Introductory Script)
2	43		Oscilloscope and function generator (Introductory Script) (Extra seminar: Error theory , the time will be announced); Exercises in error theory
3	44		Measurement of ohmic resistances, bridge circuits, and internal resistances of voltage sources
4	45		Measurement of capacities – Charging and discharging of capacitors
5	46		Sensors for force, pressure, distance, angle and light intensity
6	47		Force, momentum and impulse of force
7	48		Data acquisition and data processing using a PC
8	49		Characterization of a transreceiver system
9	50		Conservation of momentum and energy - Law of collision
10	51		Viscosity and Reynolds numbers
11	2		Forced mechanical oscillations
12	3		Fourier analysis
13	4		Surface tension, minimal surfaces and coffee stains
14	5		Moment of inertia - Steiner's theorem

The first experiments performed in the introductory laboratory course in physics serve to become acquainted with measuring instruments, function generators, sensors and data acquisition as well as data processing using a PC and to carry out introductory quantitative measurements. Only part of the subjects treated in these experiments are dealt with in the lecture, too. A sound school knowledge of physics, however, will do all right to understand them.

The following experiments are thematically coupled to the lecture contents that are dealt with synchronously.

An *Open Lab* is offered at a time announced on the notice-board of the laboratory course. During this time the labs are opened and the devices are placed at the students' disposal. By this, the possibility is offered to the students to deepen and improve experimental abilities independently and to repeat experiments if necessary. Supervision is done in turns by one of the tutors and technical assistants.

Recommended values of some fundamental physical constants (2018) ¹

Constant	Symbol	Value	Unit	Remark
Atomic mass unit	u	1,660 539 06660 (50)·10 ⁻²⁷	kg	
Avogadro constant	N_A	6,022 140 76·10 ²³	mol ⁻¹	exact
Boltzmann constant	k	1,380 649 ·10 ⁻²³	J/K	exact
Electric constant: $1/(\mu_0 c^2)$	ϵ_0	8,854 187 8128(13)·10 ⁻¹²	Fm ⁻¹	
Elementary charge	e	1,602 176 634....·10 ⁻¹⁹	C	exact
Faraday constant	F	96 485 332 12.....	C/mol	
Constant of gravitation	G	6,674 30 (15)·10 ⁻¹¹	m ³ /(s ² kg)	
Speed of light in vacuum	c	2,99792458·10 ⁸	m/s	exact
Magnetic constant: $4\pi\cdot 10^{-7}$	μ_0	1,25663706212(19)·10 ⁻⁶	NA ⁻²	
Molar gas constant	R	8,314 462 618	J/(mol K)	
Planck constant	h	6,626 070 15·10 ⁻³⁴	Js	exact
Electron mass	m_e	9,109 383 7015(28)·10 ⁻³¹	kg	
Neutron mass	m_n	1,674 927 498 04·10 ⁻²⁷	kg	
Proton mass	m_p	1,672 621 923 69·10 ⁻²⁷	kg	
Standard acceleration of gravity	g	9,80665	m/s ²	exact (Definition)

The numbers in parentheses indicate the single standard deviation in units of the last decimal position.

Prefixes

Factor	Name	Symbol	Factor	Name	Symbol
10 ⁻¹	deci	d	10 ¹	deca	da
10 ⁻²	centi	c	10 ²	hecto	h
10 ⁻³	milli	m	10 ³	kilo	k
10 ⁻⁶	micro	μ	10 ⁶	mega	M
10 ⁻⁹	nano	n	10 ⁹	giga	G
10 ⁻¹²	pico	p	10 ¹²	tera	T
10 ⁻¹⁵	femto	f	10 ¹⁵	peta	P
10 ⁻¹⁸	atto	a	10 ¹⁸	exa	E
10 ⁻²¹	zepto	z	10 ²¹	zetta	Z
10 ⁻²⁴	yocto	y	10 ²⁴	yotta	Y

¹ Source: https://physics.nist.gov/cuu/pdf/wall_2018.pdf: "CODATA Recommended Values of the Fundamental Physical Constants: 2018", Mai 2019.