DOWNLOAD PDF LABORATORY COURSE IN EXPERIMENTAL PHYSICS

Chapter 1 : Full text of "A laboratory course in experimental physics"

A Laboratory Course in Experimental Physics by W. J. Loudon A Handbook of Physics by William Herbert White A History of Physics in Its Elementary Branches Including the Evolution of Physical Laboratories by Florian Cajori.

The content of the course and the particular experiments to be carried out are chosen to be especially useful for students who intend to work in the health sciences. Specific topics will range from mechanics to nuclear and atomic physics. Science and Science Fiction Various seminars are offered that introduce first-year students to current topics of modern physics. These are mini courses that meet for half a semester. In the past, seminar topics have included: These seminars are open only to MCS first year students. Mini Session - 3 units Experimental Physics This course provides first year students and sophomores with an introduction to the methods of experimental physics. Particular emphasis is placed on three aspects of experimentation: The concepts and skills for measurement and data analysis are acquired gradually through a series of experiments covering a range of topics from mechanics to nuclear and atomic physics. Basic principles of mechanics and thermodynamics are developed. One fifth of the course covers waves, including standing and traveling waves, superposition, beats, reflection, and interference. The remaining two fifths cover magnetism, including magnetic forces, magnetic fields, induction and electromagnetic radiation All Semesters: The course will build models to describe the universe based on a small number of fundamental physics principles. Topics covered will include vectors, momentum, force, gravitation, oscillations, energy, quantum physics, center of mass motion, angular momentum, statistical physics, and the laws of thermodynamics. No computer experience is needed. Electricity and magnetism is developed, including the following topics: Elementary physics of vibrating systems. Anatomy of the ear and the perception of sound: Standing waves and natural modes. Qualitative description of general periodic systems by Fourier analysis: The acoustics of musical instruments including percussion instruments, such as drums, bars, and struck and plucked strings; and instruments exhibiting self-sustained oscillations, including bowed strings, blown pipes, reeds, brasses, and singing. Intervals and consonance, musical scales, tuning and temperament. Basic room and auditorium acoustics. There are no formal prerequisites, but an ability to read music and having some previous musical experience will be very useful. Examples include energy production, global warming, radioactivity, terrorism, and space travel. This course aims to provide key bits of knowledge based on which such issues can be discussed in a meaningful way, i. We will cover an unusually wide range of topics, including energy, heat, gravity, atoms, radioactivity, chain reactions, electricity, magnetism, waves, light, weather, and climate. No calculus or algebra will be required. The course is open for all students at CMU. Guided by selected readings from current scientific literature, and aided by order-of-magnitude estimates and careful calculations, we will ponder whether the films are showing things which may fall into one of the following categories: Science fiction at the time of production, but currently possible, due to recent breakthroughs. Possible, in principle, but beyond our current technology. Impossible by any science we know. Topics to be covered include the future of the technological society, the physics of Star Trek, the nature of space and time, extraterrestrial intelligence, robotics and artificial intelligence, biotechnology and more. Success of this course will depend upon class participation. Students will be expected to contribute to discussion of assigned readings and problems, and to give brief presentations in class on assigned films. Topics covered will include vectors, momentum, force, gravitation, oscillations, energy, quantum physics, center of mass motion, rotation, angular momentum, statistical physics, and the laws of thermodynamics. Examples illustrating basic principles being presented will be taken from physics, chemistry, and biology. The course will consist of eight portions covering 1 electrostatics and dynamics, 2 electrical circuits, 3 magnetism, 4 waves, 5 optics, 6 diffusive motion, and 7 hydrostatic forces and flow. Emphasis will be put on the application of the underlying physical principles in the study of biology and chemistry. This course presents a broad view of astronomy, straightforwardly descriptive and without any complex mathematics. The goal of the course is to encourage non-technical students to become scientifically literate and to appreciate new developments in the world of science, especially in the rapidly developing field of astronomy. Subjects covered include the solar system, stars, galaxies and the universe as a whole. The student should develop an appreciation of the ever-changing universe and our place within it. Computer laboratory exercises will be used to gain practical experience in astronomical techniques. In addition, small telescopes will be used to study the sky. It overviews the scientific method, teaches how to obtain knowledge from data and to develop physics-based models of natural phenomena, trains how to use astronomical instruments telescope to make observations and to explain these observations qualitatively, and explains how to apply of the state-of-the art professional software to study our universe. Astronomy is one of the oldest fields of science with at least years of recorded history. On the astronomy side, major topics of this laboratory course include an overview of the Solar system and the Universe. The goals of the laboratory course are to expand the student? Students with particularly strong physics backgrounds may volunteer for this course. Modeling of physical systems, including 3D computer modeling, with emphasis on atomic-level description and analysis of matter and its interactions. Emphasis on atomic-level description and analysis of matter and its electric and magnetic interactions. Computer modeling and visualization; desktop experiments. Two fifths cover magnetism, including magnetic forces, magnetic fields, induction and electromagnetic radiation. One fifth of the course covers mechanical waves including standing and traveling waves, superposition, and beats and electromagnetic waves including mode of propagation, speed, and other properties. There is an emphasis on atomic-level description and analysis of matter and its electric and magnetic interactions. There will also be computer modeling, visualization and desktop experiments. We discuss several of the sub-fields of Physics in order to give students an understanding of the types of activities, from research to industrial applications, in each. Over the two semesters, we typically discuss six subfields in some detail with the goal of providing a minimal literacy in the relevant concepts and language. Modern Essentials Physics III is primarily for third-semester students of physics, including all physics majors, but is open to any qualified student who wants an introduction to the physics of the 20th century. The course will have a strong component of Special Relativity, dealing with kinematics and dynamics, but not electricity and magnetism. It will introduce students to a conceptual theory, which is mathematically simple but initially non-intuitive. The course also provides a broad exposure to quantum phenomena and early quantum theory without getting overly mathematical. It leads into the more formal Quantum Physics course It treats the Mechanics aspects of Special Relativity, including topics such as simultaneity, the Lorentz transformation, time dilation, length contraction, space-time geometry, resolving some famous puzzles, and the momentum, mass, and energy relations. Mini Session - 4 units Prerequisites: As our astronomical horizon expands, we are still able to use the laws of physics to make sense of it all. This course is for students who want to understand the basic concepts in astronomy and what drives astronomical objects and the universe. The course emphasizes the application of a few physical principles to a variety of astronomical settings, from stars to galaxies to the structure and evolution of the universe. Introductory classical physics is required, but modern physics will be introduced as needed in the course. The course is intended for science and engineering majors as well as students in other disciplines with good technical backgrounds. Computer lab exercises will be used to gain practical experience in astronomical techniques. In addition, small telescopes are available for personal sign-out for those who would like to use them, and outdoor observing sessions will be organized as weather permits. The duality between wave-like and particle-like phenomena is introduced along with the deBroglie relations which link them. We develop a wave description appropriate for quanta which are partially localized and discuss the interpretation of these wavefunctions. The wave equation of quantum mechanics is developed and applied to the hydrogen atom from which we extrapolate the structure of the Periodic Table. Other materials-related applications are developed, for example, Boltzmann and quantum statistics and properties of electrons in crystals. This course is intended primarily for non-physics majors who have not taken

Chapter 2 : Physics (PHYS) | Undergraduate Catalog

Junior Lab consists of two undergraduate courses in experimental physics. The course squence is usually taken by Juniors (hence the name). Officially, the courses are called Experimental Physics I and II and are numbered for the first half, given in the fall semester, and for the second half, given in the spring.

Professor Nora Berrah Department Office: Room , Physics Building, Major requirements Q. Elements of Physics Four credits. Three class periods and one 2-hour laboratory period. Basic concepts and applications of physics for the non-science major. Scientific principles and quantitative relationships involving mechanics, energy, heat and temperature, waves, electricity and magnetism, and the theory of the atom are covered. A laboratory provides hands-on experience with the principles of physics. Introductory Astronomy Three credits. A basic introductory astronomy course without laboratories, including principles of celestial coordinate systems and telescope design; applications of fundamental physical laws to the sun, planets, stars and galaxies; evolution of stars, galaxies and the universe; recent space probe results, modern cosmology, astrobiology. Night observing sessions are an integral part of the course. Introductory Astronomy with Laboratory Four credits. A basic introductory astronomy course including principles of celestial coordinate systems and telescope design; applications of fundamental physical laws to the sun, planets, stars and galaxies; evolution of stars, galaxies and the universe; recent space probe results, modern cosmology, astrobiology. Basic quantitative laboratory techniques relevant to astronomy. Physics of the Environment Three credits. No previous knowledge of physics is assumed. Physics of the Environment with Laboratory Four credits. Concepts of physics applied to the physical environment, particularly to current problems related to energy, transportation, and pollution. These relationships will be further explored in the laboratory section. Physics of Music Four credits. Basic principles of physics and scientific reasoning will be taught in the context of the production and perception of music, emphasizing the historic and scientific interplay between physics and music. Basic quantitative laboratories pertaining to sound, music, and waves. No previous knowledge of physics or music is assumed. General Physics Four credits each semester. Three class periods and one 3-hour laboratory period. Basic facts and principles of physics. The laboratory offers fundamental training in precise measurements. General Physics Problems Three credits. Problems, emphasizing applications of calculus, dealing with topics in general physics. Physics for the Pharmacy Profession Three credits. Survey of the principles of physics and their application to the pharmaceutical sciences. Basic concepts of calculus are used. Examples from mechanics, electricity and magnetism, thermodynamics, fluids, waves, and atomic and nuclear physics. General Physics with Calculus Four credits each semester. Quantitative study of the basic facts and principles of physics. The laboratory offers fundamental training in physical measurements. Recommended for students planning to apply for admission to medical, dental or veterinary schools and also recommended for science majors for whom a one year introductory physics course is adequate. Physics for Engineers I Four credits. Elementary concepts of calculus are used. Classical dynamics, rigid-body motion, harmonic motion, wave motion, acoustics, relativistic dynamics, thermodynamics. Physics for Engineers II Four credits. Electric and magnetic fields, electromagnetic waves, quantum effects, introduction to atomic physics. General Physics Problems for Engineers Four credits. Three class periods and one 1-hour recitation period. Introduction to Modern Physics Four credits. Three class periods, one recitation period and one 3-hour laboratory period. MATH Q , which may be taken concurrently, or a qualifying score on the mathematics placement assessment. Quantitative exploration of the structure of matter, including gas laws, electric and magnetic forces, the electron, x-rays, waves and light, relativity, radioactivity, and spectra. Recommended for prospective Physics majors. Fundamentals of Physics I Four credits. May be taken for not more than three credits, with the permission of the instructor, by students who have received credit for PHYS Q. Fundamental principles of mechanics, statistical physics, and thermal physics. Fundamentals of Physics II Four credits. Fundamental principles of electromagnetism, optics and wave propagation. Computational Physics Three credits. Two class periods and one 2-hour laboratory period. A basic introduction to numerical and mathematical methods required for the solution of physics problems using currently available scientific software for computation and graphics. The Development of Quantum Physics Three credits. The inadequacies of classical physical concepts in the submicroscopic domain. The revision of physical principles that led to special relativity and modern quantum theory. Application to topics chosen from atomic and molecular physics, solid state physics, nuclear physics and elementary particle physics. Mathematical Methods for the Physical Sciences Three credits. Theoretical mathematical methods required for physical science courses. Laboratory in Electricity, Magnetism, and Mechanics Three credits each semester. One class period, one 3-hour laboratory period, and additional assignments on the theoretical interpretation of experiments. One hour lecture per week. A written presentation of methods and results is required for each experiment. ENGL or or Experiments with mechanical phenomena. Experiments with electric and magnetic phenomena, including their interaction with matter. The handling of experimental data. The use of computers in experimental physics. Foundations of Modern Astrophysics Three credits. The conceptual framework describing astronomical objects. Topics include orbits, light, and stars. Concepts of statistical mechanics, quantum mechanics, and relativity as needed for astrophysical topics. Techniques of Modern Astrophysics Three credits. Observational astronomy and applications to astrophysical phenomena. Topics include telescopes and astronomical instrumentation, production of chemical elements and molecules, distance scales, black holes and compact objects, gravitational lensing, galaxy kinematics and structure, dark matter, dark energy, cosmic rays, gravitational waves, and Big Bang cosmology. Mechanics I Three credits. Mechanics II Three credits. Two class periods and one 3-hour laboratory period. The principles of devices and their applications to instrumentation in science and engineering. Rectification, filtering, regulation, input and output impedance, basic transistor circuits, operational amplifiers, preamplifiers for photodiodes and other transducers, logic gates, and digital circuits. Electricity and Magnetism I Three credits. Properties of electric and magnetic fields; direct and alternating current circuits. Electricity and Magnetism II Three credits. Mathematical theory of the electromagnetic field; electric and magnetic properties of matter. Statistical and Thermal Physics Three credits. PHYS and The laws of thermodynamics and their microscopic statistical basis; entropy, temperature, Boltzmann factor, chemical potential, Gibbs factor, and the distribution functions. Introductory Quantum Mechanics Three credits each semester. Elementary principles of quantum mechanics; applications to electrons, atoms, molecules, nuclei, elementary particles, and solids. Modern Experimental Methods Three credits. One 3-hour laboratory per week and one lecture hour per week. In-depth exploration of classical and quantum phenomena through advanced experimentation using contemporary methods. Undergraduate Research Credits, not to exceed three each semester, and hours by arrangement. Open only with consent of instructor. May be repeated for credit. Introduction to original investigation performed by the student under the guidance of a faculty member.

Chapter 3 : PHYS Experimental Physics Laboratory | Houghton College

A Laboratory Course in Experimental Physics and millions of other books are available for Amazon Kindle. Learn more Enter your mobile number or email address below and we'll send you a link to download the free Kindle App.

Chapter 4 : Physics Course List | Harvard University Department of Physics

Search the history of over billion web pages on the Internet.

Chapter 5 : MIT - Experimental Physics I & II "Junior Lab" - student reviews | CourseTalk

i Preface Thesenotesaremeanttoaccompanycourse PHYS Experimental Physics, for the Spring semester. They should make it mucheasier for you to fol-low the.

Chapter 6 : Undergraduate Courses - Department of Physics - Carnegie Mellon University

DOWNLOAD PDF LABORATORY COURSE IN EXPERIMENTAL PHYSICS

Note: Citations are based on reference standards. However, formatting rules can vary widely between applications and fields of interest or study. The specific requirements or preferences of your reviewing publisher, classroom teacher, institution or organization should be applied.

Chapter 7 : Experimental Physics I & II "Junior Lab" | Physics | MIT OpenCourseWare

PHYSICS - Laboratory Course in Contemporary Physics: see PHYSICS PHYSICS R - Topics in Experimental Particle Physics Masahiro Morii: Fall M, W: am - am Course website: Topics in the elementary particle physics, focusing on experimental studies of the Standard Model and new physics beyond the Standard Model in the past 20 years.

Chapter 8 : A Laboratory Course in Experimental Physics

Course Description This semester we will focus on the procedures, methods, apparatus, and theory of nuclear science, and finish with a field trip to the University of Maryland Nuclear Reactor and Radiation Facilities to carry out an experiment using their research reactor.