

Course Information TNE041 Modern Physics 2023

Aim: Can be found in Study Information (<https://studieinfo.liu.se/kurs/TNE041/vt-2023>).

Prerequisites: TNA006 Multivariable calculus, TNE043 Mechanics and Wave Physics, or similar courses.

Examiner, lecturer: Michael Hörnquist, office TP6168, email michael.hornquist@liu.se

Contents:

Relativistic dynamics, Quantum mechanics: interaction between electromagnetic radiation and matter, wave-particle dualism, the uncertainty principle. The Schrödinger equation with applications on simple systems. The Pauli principle, multielectron atoms. Statistical physics: Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein distributions with applications. Solid state physics: Crystal structures, lattices, electrical conductivity of semiconductors, band theory.

Course home page: The course will be available in Lisam, <http://lisam.liu.se>

Organisation: lectures 22 h, tutorials 16 h, computer lab sessions 8 h, seminar 2 h. Lectures and tutorials will be given in English if necessary. Course material such as lecture notes and lab instructions will be available in English only. A course outline with lecture contents and a selection of relevant problems in the textbook is available in Lisam.

Course literature:

The textbook is: R Harris: Modern Physics, Second Edition (Pearson Addison-Wesley)

There are several versions of the same book: Try to find one which is “Compiled by Mats Eriksson Linköping University”. The latest version has ISBN: 978-1-783-76953-7. It contains sometimes an access code, not used in this course, and which you do not need to worry about if you buy a used copy.

Another version of the book used previously with the same contents has ISBN 978-0-321-52667-0.

There is also “New international edition”, Pearson Education, ISBN 978-1-29202-326-7. Almost the same contents as the ones above, there is a small difference in the order of chapters, and it has an Index that is not very useful. Also available as e-book.

In addition to the textbook, you also need

C Nordling, J Österman: Physics Handbook for Science and Engineering (Studentlitteratur). The latest edition has number 9, but previous editions can be used as well.

Additional material will be available in Lisam.

Examination:

1) A written examination (tentamen, TEN1, 4.5 hp) that consists of 6 problems and with a maximum score of 24 points (6x4). To pass the examination, a minimum of 10 points is required (15 points for grade 4, 19 points for grade 5). The problems will be given in English, but the solutions may be given in either English or Swedish.

Two sets of homework problems will be distributed, 10 February and 1 March, respectively. These problems are *not* compulsory, but may give 1 or maximum 2 bonus points at the written examination. As part of the second set there will be a short oral presentation and discussion (scheduled as seminar) at the end of the course. Deadlines are one week after distributions. other detailed information will be provided through Lisam.

2) The computer lab sessions (LAB1, 1.5 hp) are scheduled as four two-hour sessions. A short written report must be submitted after each session, and all reports must be approved to obtain grade pass (G) on the lab assignments. Attending the scheduled lab sessions is *not* compulsory. You may work with the assignments at other times, but the reports must be submitted before the deadlines that will be *one week after* each scheduled lab session. Any corrected versions of reports must be submitted not later than *6 April*. If reports have not been given the grade pass (G) by this date, one opportunity will be given in August 2023.

You are allowed to bring the following to the written examination (tentamen): Calculator (with no information stored and no possibility of wireless connection), Physics Handbook, one handwritten page (A4, not copied) with notes of your own choice. Notes *must* be confined to the handwritten page, no notes allowed in Physics Handbook. Two pages with formulae will be available in Lisam. Don't bring these to the examination yourself; they will be attached to the examination problems.