

## Course Information TNE041 Modern Physics 2020

**Aim:** Can be found in Study Information (Studieinfo).

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

**Examiner, lecturer:** Ulf Sannemo, office TP6139, email [ulf.sannemo@liu.se](mailto:ulf.sannemo@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 text book is

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

There are several versions of the same book:

The version sold by Bokab has ISBN: 978-1-78447-415-7. It is a “package” with text book + an access code that is not used in this course attached to the book.

The book without package has ISBN 978-1-78376-953-7 and is a “custom edition” compiled by Mats Eriksson, IFM.

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.

In addition to the text book you also need

C Nordling, J Österman: Physics Handbook for Science and Engineering (Studentlitteratur). The latest (8<sup>th</sup>) edition has ISBN 9789144044538, but previous editions can be used as well.

Additional material and the computer lab assignments 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. The problems will be given both in English and Swedish and the solutions may be given in either language.

Two sets of homework problems will be distributed. These problems are *not* compulsory, but may give 1 or maximum 2 bonus points at the written examination. Deadlines: **Feb 21** (first set) and **March 10** (second set). As part of the second set there will be a short oral presentation and discussion (scheduled as seminar) at the end of the course. More information will be given when the course starts.

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, as long as the reports are 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 **April 6**. If reports have not been given the grade pass (G) by this date, one opportunity will be given in August 2020.

**You are allowed to bring the following to the written examination (tentamen):** Calculator (with no information stored and no possibility of wifi 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.