10752-713(8) Solid State Physics (1½l, 1½p)

2018

Course summary:

Diffraction by crystals and the reciprocal lattice. Periodic crystal potentials, the tight-binding model, semi-conductors. Magnetism: para-, dia-, ferro- and antiferromagnetism. Superconductivity.

Module relevance in programme:

The course aims to introduce fundamental concepts and techniques for describing matter in its solid state. The student will be exposed to the standard approximations, models and methods concerning this discipline. Important applications in current-day technology, industry, and research will be introduced as well.
Learning Goals: Specific heat problem in a crystal; Free electron gas; Vibration in solids and phonons; Geometry of crystals; Neutron and X-ray diffraction; Electron in solids and bands theory; Physics of semiconductors: an introduction; Magnetism: an introduction.

Outcomes of course:

The course is intended as introduction to various aspects of solid state physics. Students who complete the course will be familiar with the basic physical principles underlying a variety of fundamental phenomena in the solid state.

Lecturer:

Dr F Cinti
Telephone number: (021) 808-3864
E-mail address: cinti@sun.ac.za
Office: Room 2006 Wallenberg Centre, STIAS, STELLENBOSCH.

Mentor:

The Department of Physics has appointed a staff member as mentor for each year of its physics programme to be available to students for consultation. Students should feel free to discuss general issues related to the physics programme or specific modules in the programme with the relevant mentor, in addition to usual consultations with their individual lecturers of modules.

The mentor for the Honours programme and its modules is Prof KK Müller-Nedebock kkmn@physics.sun.ac.za.

Course content:

Specific heat problem: Boltzmann, Einstein and Debye model. Electrons in metals: Drude and Sommerfeld theory. Vibration in solids and phonons... Geometry of crystals. Neutron and X-ray diffraction. Electron in solids bands theory and tight binging model.. Application to the bands theory: physics of semiconductors. Magnetism: para-, dia- ,ferro- and antiferromagnetism.

Practical (Tutorials):

Weekly tutorials (as per honours course schedule)

Study material:

Prescribed textbook: S.H.Simon “The Oxford Solid State Basic”, Oxford University Press (2013).

Assessment:

Methods of Assessments
Assessment shall occur by means of continuous assessment, comprising the following: One final written exam which includes exercises only; one oral part regarding theoretical questions on the subjects discussed in class along the course; three homework assignments;

Venue and time of assessment opportunities
See timetable

Availability of marks:
Immediately following assessment or assignment.

Calculation of final mark for the module:
Final written exam 50/100, final oral exam 20/100, homework assignments 30/100.