

# 10610-747(8) Molecular Physics (1½l, 1½p)

2017

## Course summary:

Quantum mechanics of rotational and vibrational degrees of freedom of molecules. Electronic spectra of molecules. The use of symmetries in molecular physics. The interaction of light with molecules. Kinetics and dynamics of elementary molecular reactions.

## Module relevance in programme:

This module builds on the undergraduate modules in quantum mechanics. The module is linked to modules in quantum mechanics 714, Quantum Optics and laser technology 745, Laser spectroscopy 744, and atomic physics 716. The module introduces basics of molecules and prepares the student for project work in the laser programme (741).

## Outcomes of course:

The course skills the student in the basis of the quantum mechanical treatment of molecules with specific emphasis on interaction with light. It also lays the foundation for courses on laser spectroscopy.

## Lecturer:

Dr JN Kriel:  
Tel: (021) 808-3658 E-mail: [hkriel@sun.ac.za](mailto:hkriel@sun.ac.za)  
Office: Room 1014 in the Merensky Physics Building.

## 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](mailto:kkmn@physics.sun.ac.za).

## Course content:

### *Formal lectures*

The following topics are covered during formal lectures: Quantum mechanics of electronic, vibrational and rotational states of diatomic molecules, spectra of molecules, interaction of light with molecules.

### **Practical (Homework):**

The allocated homework is designed to consolidate and widen the subjects presented in the lectures.

### **Study material:**

Prescribed textbook: "**Molecular physics and elements of quantum chemistry**" (Springer) Haken and Wolf.

**Learning opportunities:**

Lectures, Tutorials, Homework

**Assessment:**

Methods of Assessments

Continuous Evaluation

Venue and time of assessment opportunities

See timetable

Availability of marks:

Within two weeks after the handing in of tasks or tests.

Calculation of final mark for the module:

Test 1 - 30% Test 2 - 50% Homework Problems - 20%

A subminimum of 40% is required in the second test in order to pass the module.