Module Description

The field of Optics was revolutionised by the invention of the laser in 1960. All types of experiments suddenly became possible, which in turn led to the development of new theories. In these lectures we will see how a laser works and we will then look at some consequences of the laser, all of this in combination with a discussion of the basic optical properties of materials. In particular, we will look at the Lorentz model as a model for the optical properties of matter, spontaneous and stimulated emission of light, rate equation analysis of lasers, diffraction, Gaussian beam propagation, anisotropic media, nonlinear optics.

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Class timetabling

The course consists of lectures and tutorials, to be given on Tuesdays at 11 am, Thursday at 11 am, and Fridays at 1 pm, all in Lecture Theatre 2.

Advanced and Regular students will have 14 or 15 common lectures. In addition, Regular students will have 3 or 4 tutorials, to be presented by Dr Nadav Gutman, whereas the Advanced students will have additional lectures at the same time in LT2. This will give these students a better understanding of some advanced topics.

Study resources

Lecture notes, assignments etc. will be made available in class.

Chapter 1 is mostly assumed knowledge but parts of it will be discussed in class.

If you have questions about the lecture material it is best to ask me after class or to email me. If you are a Regular student then you will of course also have a number of tutorials where you can ask questions.

Assessment

There will be 2 assignments, due on Wednesday 17 August and Monday 19 September. Assignment marks contribute 25% of the total mark.

A Quiz will be held during lecture time on Tuesday 30 August in Lecture Theatre 2. This Quiz contributes 20% of the final mark.

The remaining 55% of the final mark will come from the final exam at the end of semester.
Where to go for help

If you need help, you can
- as a first step, always check your unit eLearning pages for information, documents and links
- go to the Physics Student Services Office, Room 210 in the Physics building, or phone 9351 3037
- ask your lecturer or tutor.
- ask other students using the Discussion forum provided in the Discussions link on the unit eLearning page.
- consult one of the many services provided by the University, such as the Maths Learning Centre. These can be found at sydney.edu.au/current_students/student_services/index.shtml or through your MyUni pages sydney.edu.au/myuni.

Consideration of factors affecting your study

If your academic performance in a Science Faculty unit of study is adversely affected by illness or some other serious event, such as an accident, you should notify the Faculty of Science Student Information Office (level 2 of the Carslaw building) within 7 days after the period for which consideration is sought, by completing an Application for Special Consideration with accompanying documentation. This is especially important if you miss an examination.

If you have another reason for the Science Faculty to take account of your circumstances - religious commitments, legal commitments (e.g. Jury duty), elite sporting or cultural commitments (representing the University, state or country), or Australian Defence Force commitments (e.g. Army Reserve) - you should notify the Faculty of Science Student Information Office (level 2 of the Carslaw building) at least 7 days BEFORE the period for which consideration is sought, by completing an Application for Special Arrangements with accompanying documentation.

These two forms of Consideration should cover most allowable circumstances. However, if you have another reason for requiring the School of Physics to take account of your circumstances, you should notify the School of Physics Student Services Office immediately.

You should not submit an application of any type if
- there is no assessment associated with a missed class, or
- you have a reasonable opportunity to make up any work you missed.

If, for example, you miss an assignment, an application for appropriate Consideration is required to allow late submission, but we do expect the assignment to be submitted. Sometimes catching up may be impossible, in which case we will consider a pro-rata adjustment of your marks on the basis of an application for Consideration.

Special Consideration or Special Arrangements

To submit an application for Special Consideration or Special Arrangements you should:
1. Obtain the appropriate Application pack from the Student Information Office of the Faculty of Science, the Faculty website at http://sydney.edu.au/cstudent/ug/forms.shtml, or the Physics Student Services Office.
2. Complete the forms and obtain whatever original documentary evidence is appropriate. Note especially that the Professional Practitioner’s Certificate is essential for Special Consideration on grounds of serious illness - Medical Certificates will NOT be accepted.
3. Take the original copy of all forms and documents, plus sufficient copies for each unit of study affected and yourself, to the Faculty of Science Student Information Office (NOT any other Faculty Office if you are seeking Consideration in a unit taught by Physics). They will sign/stamp both the original application form and the copies. In the case of Physics units, one copy of the documentation must then be submitted to the Physics Student Services Office. Keep one copy yourself. A formal decision on your application will be sent to your university email address within 14 days.

Further details on University policy regarding Considerations can be found in policy documents entitled Assessment and Examination at the University Policy web site (sydney.edu.au/policy).

Students unsure what type of Consideration is appropriate, or unhappy with a Consideration decision, should consult the Physics Student Services Office.

It is important to realise that the policies on Special Consideration and Special Arrangements apply throughout the University. Policies on other forms of Consideration are specific to Physics and may be different in Departments responsible for your other units of study.
Module Description

Topics covered include:

1. Plane wave propagation
2. The Lorentz atom
3. Transition rates
4. Rate equation analysis of lasers
5. Light propagation in anisotropic media
6. Paraxial scalar wave equation
7. Gaussian beams
8. Diffraction at apertures
9. Introduction to nonlinear optics