PHYS2011: Physics 2A (Normal)
Semester 1, 2012 | 6 Credit Points | Coordinator: A/Prof. Mike Wheatland (m.wheatland@sydney.edu.au)

1 Introduction

PHYS 2011 continues a first pass through all major branches of classical and modern physics, providing students with a sound basis for later Physics units or for studies in other areas of science or technology. Hence this unit suits students continuing with the study of physics at the general Intermediate level, and those wishing to round out their knowledge of physics before continuing in other fields.

The unit comprises a number of modules, combining lectures on Optics and Thermodynamics with sessions on computational physics in the Computational Science Laboratory on the topic of Optics, and sessions on Experimental Physics in the Intermediate Physics Laboratory. Some of these activities are in common with the unit of study PHYS 2911 Physics 2A (Advanced).

1.1 Assumed Knowledge and Prohibitions

Students must have completed 12 credit points of Junior Physics (excluding PHYS 1500). It is assumed that students have taken MATH (1001/1901 and 1002/1902 and 1003/1903). MATH (1005/1905) would also be useful. PHYS 2011 may not be counted with PHYS 2001, PHYS 2901, PHYS 2911, PHYS 2213, or PHYS 2203.

2 Course Aims, Learning Objectives and Graduate Attributes

2.1 Course Aims

The unit is designed to help you develop appropriate methods of study that will allow you to become an independent learner, capable of organising new information into a coherent conceptual framework and applying it in both familiar and unfamiliar situations. In addition, you are introduced to basic experimental skills in the measurement of physical quantities and analysis of experimental data.

2.2 Learning Outcomes

After successfully completing this unit, you should be able to demonstrate:

1. an understanding of the key concepts in two foundation areas of physics - optics and thermodynamics;
2. the ability to apply these concepts to develop models, and to solve qualitative and quantitative problems in scientific and engineering contexts, using appropriate mathematical and computing techniques as necessary;
3. an understanding of the nature of scientific measurement, and skills in the measurement of physical quantities and the handling of data;
4. the ability to find and analyse information and judge its reliability and significance;
5. the ability to communicate scientific information appropriately, both orally and through written work;
6. the ability to engage in team and group work for scientific investigations and for the process of learning;
7. a sense of responsibility, ethical behaviour and independence as a learner and as a scientist.
2.3 Graduate Attributes

Graduate Attributes are generic attributes that encompass not only technical knowledge but additional qualities that will equip students to be strong contributing members of professional and social communities in their future careers. The overarching graduate attributes identified by the University relate to a graduate’s attitude or stance towards knowledge, towards the world, and towards themselves. These are understood as a combination of five overlapping skills or abilities, the foundations of which are developed as part of specific disciplinary study. For further details please refer to the Science faculty website at: http://www.itl.usyd.edu.au/graduateAttributes/facultyGA.cfm?faculty=Science

<table>
<thead>
<tr>
<th>Graduate Attributes</th>
<th>Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A Research and Inquiry</strong></td>
<td></td>
</tr>
<tr>
<td>A1. Apply scientific knowledge and critical thinking to identify, define and analyse problems, create solutions, evaluate opinions, innovate and improve current practices.</td>
<td>2, 3, 4</td>
</tr>
<tr>
<td>A2. Gather, evaluate and deploy information relevant to a scientific problem.</td>
<td>1, 2, 3, 4</td>
</tr>
<tr>
<td>A4. Critically examine the truth and validity in scientific argument and discourse, and evaluate the relative importance of ideas.</td>
<td>2, 3, 4</td>
</tr>
<tr>
<td><strong>B Information Literacy</strong></td>
<td></td>
</tr>
<tr>
<td>B1. Use a range of searching tools (such as catalogues and databases) effectively and efficiently to find information.</td>
<td>4</td>
</tr>
<tr>
<td>B2. Access a range of information sources in the science disciplines, for example books, reports, research articles, patents and company standards.</td>
<td>4</td>
</tr>
<tr>
<td>B3. Critically evaluate the reliability and relevance of information in a scientific context.</td>
<td>1, 2, 3, 4</td>
</tr>
<tr>
<td>B5. Use information technology to gather, process, and disseminate scientific information.</td>
<td>4, 5</td>
</tr>
<tr>
<td><strong>C Communication</strong></td>
<td></td>
</tr>
<tr>
<td>C2. Write and speak effectively in a range of contexts and for a variety of different audiences and purposes.</td>
<td>2, 5</td>
</tr>
<tr>
<td>C4. Present and interpret data or other scientific information using graphs, tables, figures and symbols.</td>
<td>3, 4, 5</td>
</tr>
<tr>
<td>C5. Work as a member of a team, and take individual responsibility within the group for developing and achieving group goals.</td>
<td>6</td>
</tr>
<tr>
<td>C6. Take a leadership role in successfully influencing the activities of a group towards a common goal.</td>
<td>1, 2, 6, 7</td>
</tr>
<tr>
<td><strong>D Ethical, Social and Professional Understanding</strong></td>
<td></td>
</tr>
</tbody>
</table>
D1. Demonstrate an understanding of the significance and scope of ethical principles, both as a professional scientist and in the broader social context, and a commitment to apply these principles when making decisions.

D2. Appreciate the importance of sustainability and the impact of science within the broader economic, environmental and socio-cultural context.

E Personal and Intellectual Autonomy

E1. Evaluate personal performance and development, recognise gaps in knowledge and acquire new knowledge independently.

For further details on course learning outcomes related to specific topics see LMS site and Course Handbook.

3 Study Commitment

The current standard workload for a 6 credit point unit of study is 6 hours per week of face-to-face teaching contact hours and up to an additional 6 hours per week of independent study. Below is a breakdown of our expectations for PHYS 2011. It should be noted that ‘Independent Study’ is based on what we believe to be the amount of time a typical student should spend to achieve to pass an item of assessment. Times are a guide only.

**Week-by-week timetable**

<table>
<thead>
<tr>
<th>Monday Date</th>
<th>Lectures in Physics LT</th>
<th>Computational Physics Lab</th>
<th>Experimental Physics Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tues 10 am</td>
<td>Thurs 10 am</td>
<td>Mon, Thurs, Fri 2 – 4 pm, Tues 3 – 5 pm</td>
</tr>
<tr>
<td>5 Mar 2012</td>
<td>OPT 1</td>
<td>OPT 2</td>
<td>No class</td>
</tr>
<tr>
<td>12 Mar 2012</td>
<td>OPT 3</td>
<td>OPT 4</td>
<td>CP 1</td>
</tr>
<tr>
<td>19 Mar 2012</td>
<td>OPT 5</td>
<td>OPT 6</td>
<td>CP 2</td>
</tr>
<tr>
<td>26 Mar 2012</td>
<td>OPT 7</td>
<td>OPT 8</td>
<td>CP 3</td>
</tr>
<tr>
<td>2 Apr 2012</td>
<td>OPT 9</td>
<td>OPT 10</td>
<td>No class</td>
</tr>
<tr>
<td>9 Apr 2012</td>
<td>MSB</td>
<td>MSB</td>
<td>MSB</td>
</tr>
<tr>
<td>16 Apr 2012</td>
<td>OPT 11</td>
<td>OPT 12</td>
<td>CP 4</td>
</tr>
<tr>
<td>23 Apr 2012</td>
<td>TH 1</td>
<td>TH 2</td>
<td>CP 5</td>
</tr>
<tr>
<td>30 Apr 2012</td>
<td>TH 3</td>
<td>TH 4</td>
<td>CP 6</td>
</tr>
<tr>
<td>7 May 2012</td>
<td>No class</td>
<td>No class</td>
<td>CP 7</td>
</tr>
<tr>
<td>14 May 2012</td>
<td>TH 5</td>
<td>TH 6</td>
<td>CP 8</td>
</tr>
<tr>
<td>21 May 2012</td>
<td>TH 7</td>
<td>TH 8</td>
<td>CP 9</td>
</tr>
<tr>
<td>28 May 2012</td>
<td>TH 9</td>
<td>TH 10</td>
<td>Review</td>
</tr>
<tr>
<td>4 Jun 2012</td>
<td>TBA</td>
<td>TBA</td>
<td>Exam</td>
</tr>
</tbody>
</table>

OPT  Optics
MSB  Mid-semester break
TH  Thermodynamics
TBA  To be announced

Good Friday is 6 April, so no Computational Physics lab that week.
Anzac Day is 25 April, so no Experimental Physics Lab that week.
### In class activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures (22 @ 1 hr each)</td>
<td>22</td>
</tr>
<tr>
<td>Computational lab sessions (11 @ 2 hrs each)</td>
<td>22</td>
</tr>
<tr>
<td>Experimental lab sessions (10 @ 3 hrs each)</td>
<td>30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>74</strong></td>
</tr>
</tbody>
</table>

### Independent Study

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading of text for lectures (22 @ 0.5 hr each)</td>
<td>11</td>
</tr>
<tr>
<td>Reading of lecture notes after lectures (22 @ 0.5 hr each)</td>
<td>11</td>
</tr>
<tr>
<td>Revision and self assessment (13 @ 1 hr each)</td>
<td>13</td>
</tr>
<tr>
<td>Assignments (2 @ 5 hr each)</td>
<td>10</td>
</tr>
<tr>
<td>Preparation for experimental lab (10 @ 0.5 hr each)</td>
<td>5</td>
</tr>
<tr>
<td>Preparation for computational lab (11 @ 0.5 hr each)</td>
<td>5.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>55.5</strong></td>
</tr>
</tbody>
</table>

### Study Tips

You are now in control of your own study strategy, and as an adult learner it is up to you to devise a study plan that best suits you. If you attend classes regularly and involve yourself in all of these learning experiences, you will gain a good understanding of the course work. This will have a considerable impact on your exam preparation and performance.

**Good study habits** are also very important - we offer some suggestions on our Learning Physics web page ([http://sydney.edu.au/science/physics/current/learningphysics.shtml](http://sydney.edu.au/science/physics/current/learningphysics.shtml)).

As **preparation**, you should read *How to Succeed in Physics by Really Trying* on pages vii - viii of the textbook, preferably before the start of semester. You should also read and understand Section 1.5, *Uncertainty and Significant Figures*, and Section 1.6, *Estimates and Orders of Magnitude*.

### 4 Learning and Teaching Activities

**MODULES STUDIED**

- Optics
- Thermodynamics

**WEEKLY SCHEDULE**

**Lectures**

You will be scheduled into one lecture stream, with two one-hour lectures per week in the lecture theatre indicated for your stream. All lectures are held in the Physics Building.

**Lectures commence Tue 6 March and end Thu 7 June**

- **Stream 1** - LT5 - 10am Tuesday and 10am Thursday

Please consult your **personal timetable on myUni** for more details.
NB: No lectures over Easter (Friday 6 April to Friday 13 April) or in the week beginning 7 May.

**Experimental Physics Laboratory Work**
The laboratory component is divided into three experiments, each taking three weeks and selected according to the rules given in the Experimental Physics Notes book.
You will be scheduled into one three-hour laboratory session per week in the Second Year Lab, on Level 2 at the western end of the Physics Building.

**Experimental Labs commence in the week of Mon 5 Mar and end in the week of Mon 28 May**

- **Stream 1** - Second Year Lab - 2-5pm Wednesday
- **Stream 2** - Second Year Lab - 2-5pm Thursday

N.B. No experimental lab over Easter (Friday 6 April to Friday 13 April) or in the week beginning 21 May.

**Computational Physics Laboratory Work**
You will be scheduled into one two-hour laboratory session per week in the Computational Physics Lab, Room 359 on Level 3 at the western end of the Physics Building. Please note that this is subject to change during the semester and you will be advised of any changes to location.

**Computational Labs commence in the week of Mon 12 Mar and end in the week of Mon 4 June**

- **Stream 1** - Room 359 - 2-4pm Monday
- **Stream 2** - Room 359 - 3-5pm Tuesday
- **Stream 3** - Room 359 - 2-4pm Thursday
- **Stream 4** - Room 359 - 2-4pm Friday

N.B. No computational lab over Easter (Friday 6 April to Friday 13 April) or in the week beginning 2 April.

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**SYLLABUS OBJECTIVES**

**Optics - Specific Objectives**
After studying the points listed below you should be able to:

**Geometrical Optics – review of basic topics**
- apply the laws of reflection and refraction
- define and use refractive index
- discuss total internal reflection
- define and calculate the critical angle
- explain and use the image-forming properties of lenses

**Physical Optics - background**
- discuss the wave nature of light
- understand the relationship between the amplitude and intensity of a light wave
- understand and discuss the Principle of Superposition
- explain Huygens’ Principle
- explain the distinction between the phenomena described as ‘interference’ and those described as ‘diffraction’
- recognise and explain the distinction between Fresnel and Fraunhofer conditions for interference or diffraction

**Two Source Interference**
- apply the Principle of Superposition to the Fraunhofer interference of two waves to derive an expression for the resultant amplitude
- discuss and apply the expressions for the resultant amplitude and intensity for two source interference (e.g. Young’s double slit experiment)
- use the relationship giving the location of interference maxima and minima as a function of wavelength and source separation
• discuss the conservation of energy in interference patterns
• describe a stellar interferometer and explain how it can be used to measure the angle between two stars

**Phasors and their applications**
• explain the phasor representation of waves, and use it to illustrate the combination of a number of wave motions, especially the cases of two waves (e.g. two source interference) or a large number ‘n’ of waves (e.g. summation of contributions from across a slit, to give single-slit diffraction).
• show how a phasor sum of waves can be used to derive the resultant amplitude and intensity

**Diffraction from a single slit**
• apply Huygens’ Principle to diffraction from a single slit
• discuss and apply the Fraunhofer diffraction pattern for a single slit and be able to draw the intensity distribution pattern illustrating the relative scales of the central and secondary maxima
• use the relationship between the angular scale of the Fraunhofer diffraction pattern for a single slit and the slit width and wavelength of the light; in particular use the equation for the locations of the intensity minima
• discuss and apply the Fraunhofer intensity pattern formed by a double slit where the slits have a non-zero width, giving a single-slit diffraction envelope which modulates the peak intensity of cosinusoidal two-source interference fringes within the envelope
• be able to sketch the intensity distribution illustrating the relative widths of the interference fringes and the central diffraction envelope
• explain the effects on the Fraunhofer diffraction pattern of changing the width of the slits, the separation of the slits, or the wavelength of the light
• define and apply Rayleigh’s criterion for resolution to single slits

**Coherence of light**
• explain the concept of spatial coherence, and use it to explain why fringes will not be seen from twin slits with unsuitable (incoherent) illumination
• explain the concept of the coherence length of light, and calculate the coherence length as a function of the centre wavelength and range of wavelengths detected

**Diffraction by Multiple Slits**
• recognise and apply the Fraunhofer diffraction pattern for multiple slits and explain the effect on the pattern of increasing the number of slits
• describe transmission and reflection diffraction gratings and their use in spectrometers
• apply the equation for angle of diffraction as a function of diffraction order, wavelength, and slit separation
• understand and use the terms angular dispersion and chromatic resolving power as applied to diffraction gratings

**Diffraction from Circular Apertures**
• recognise the Fraunhofer diffraction pattern for a circular aperture and be able to draw the intensity distribution pattern illustrating the relative scales of the central and secondary maxima
• apply the dependence of the angular scale of the Fraunhofer diffraction pattern (as given by the location of the first intensity minimum) for a circular aperture on the diameter of the aperture and on the wavelength of the light
• define and apply Rayleigh’s criterion for resolution to circular apertures

**Polarisation**
• define what is meant by unpolarised, plane polarised, circularly polarised, and partially polarised light
• appreciate that the phenomena of polarisation show that light is a transverse wave
• discuss the use of polarising filters (such as Polaroid) to produce linearly polarised light
• apply Malus’ law relating the intensity transmitted by a polarising filter to the angle between the plane of incident polarisation and the transmission axis
• discuss the production of polarised light by specular reflection at non-metallic surfaces, with complete linear polarisation at the Brewster angle
• discuss the phenomena of birefringence, circular polarisation, quarter-wave plates and photoelasticity

**Interference in Thin Films**
• discuss the formation of interference fringes in light reflected from thin films
• appreciate that such fringes can be formed even with a spatially extended light source
• recognise the π phase change that occurs when reflection occurs at a boundary where the refractive index increases
• explain and use the equation for net phase difference of the combining rays, as a function of the film thickness, the refractive indices of the film and surrounding media, and the wavelength of the light
• use the phase difference between combining rays to find whether the rays undergo constructive, destructive or partial interference
• discuss the formation of fringes of equal thickness (contour fringes) in non-uniform thin films
• understand the relationship of the fringe spacing to the refractive indices of the film and surrounding media, the varying thickness of the film, and the wavelength of the light
• discuss the formation of fringes of equal inclination in uniform thin films
• understand the relationship of the fringe spacing to the refractive indices of the film and surrounding media, the thickness of the film, and the wavelength of the light
• discuss single layer anti-reflection coatings and be able to relate the thickness of such a film to the refractive indices of the coating and coated material and to the wavelength of incident light

The Fabry-Perot Interferometer
• draw a cross-section of a Fabry-Perot interferometer with representative reflected and transmitted light rays, and explain the function and operation of the interferometer
• define and apply the terms free spectral range and chromatic resolving power for a Fabry-Perot interferometer
• discuss the form of the transmitted intensity as a function of phase difference δ, and how this gives rise to the observed ring systems
• appreciate why the maximum transmission of a Fabry-Perot interferometer is near 100%, despite each of the surfaces being strongly reflective

Optical fibres and fibre gratings
• draw a diagram showing the propagation of light rays in an optical fibre, and explain the physical principles behind such propagation
• explain the nature of a fibre Bragg grating, and the strong wavelength dependence of the reflectivity for light encountering the grating

Thermodynamics - Specific Objectives
After studying the points listed below you should be able to:

Entropy and the Second Law of Thermodynamics
• compare and contrast the concepts of microstates and macrostates of a system
• relate the concept of entropy of a system to its microstate and macrostate
• apply the second law of thermodynamics to assess the (im)possibility of various processes
• apply the second law and entropy to processes involving an ideal gas
• apply the second law and entropy to the characterisation of black holes

Equilibrium and the Chemical Potential
• define, both qualitatively and quantitatively, temperature and pressure in terms of equilibrium
• apply the thermodynamic identity to the quantitative analysis of general processes
• define and interpret the chemical potential of a system in terms of equilibrium
• use the chemical potential to solve for equilibrium conditions in idealized problem including ideal gases

Free Energy
• choose the appropriate form of free energy to describe a thermodynamic process
• contrast free energy with internal energy, and identify situations where free energy is more relevant
• calculate the energy consumed/released in chemical reactions such as electrolysis and fuel cells

Relation to Classical Thermodynamics
• contrast the statistical definition of entropy to the classical definition obtained from the 2nd law of thermodynamics and the properties of heat engines
• contrast the properties of reversible and irreversible processes
Chemical Thermodynamics
• identify and describe phases and phase transformations
• apply the Clausius-Clapeyron relation to quantitatively describe phase changes of a pure substance
• derive conditions for chemical equilibrium in terms of the chemical potential
• analyse dilute solutions and calculate osmotic pressure

Note: it may be that the limited time will not allow us to address all of these points.

Computational Lab - Specific Objectives
After studying the points listed below you should be able to:

• understand what MATLAB is
• solve simple equations by using MATLAB built-in functions
• understand visualization techniques used in computation
• understand the Methods of calculation diffraction patterns from slits using Huygens’ Principle
• explain Fraunhofer patterns produced by diffraction gratings based on computer simulations
• gain a deep understanding of diffraction patterns produced by an etalon based on the visualization codes

Experimental Lab - Specific Objectives
After studying the points listed below you should be able to:

• Perform physics experiments, analyse and interpret data and draw conclusions from your results
• Solve experimental problems in physics and link these to appropriate theories
• Work independently and in groups
• Present the results of physics experiments orally and in the form of a written report
• Appreciate the role of computers and other equipment in experimental physics
• Make effective records in a logbook, and calculate uncertainties when appropriate

5 Teaching Staff and Contact Details

<table>
<thead>
<tr>
<th>Unit Coordinator</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/Prof. Mike Wheatland</td>
<td><a href="mailto:m.wheatland@sydney.edu.au">m.wheatland@sydney.edu.au</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teaching Staff</th>
<th>Email</th>
<th>Room</th>
<th>Phone</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/Prof. Mike Wheatland</td>
<td><a href="mailto:m.wheatland@sydney.edu.au">m.wheatland@sydney.edu.au</a></td>
<td>Physics, Room 463</td>
<td>9351 5965</td>
<td>2nd year coordinator</td>
</tr>
<tr>
<td>A/Prof. John O’Byrne</td>
<td><a href="mailto:john.obyrne@sydney.edu.au">john.obyrne@sydney.edu.au</a></td>
<td>Physics, Room 568</td>
<td>9351 3184</td>
<td>Optics - Normal</td>
</tr>
<tr>
<td>Prof. Tim Bedding</td>
<td><a href="mailto:bedding@physics.usyd.edu.au">bedding@physics.usyd.edu.au</a></td>
<td>Physics, Room 558</td>
<td>9351 2680</td>
<td>Optics - Advanced</td>
</tr>
<tr>
<td>Dr Alex Argyros</td>
<td><a href="mailto:a.argyros@physics.usyd.edu.au">a.argyros@physics.usyd.edu.au</a></td>
<td>Physics, Room 443</td>
<td>9114 0872</td>
<td>Thermodynamics - Normal</td>
</tr>
</tbody>
</table>
6 Learning Resources

Optics:
The Optics lecture modules are based on the textbook:
**Note:** Lecture overheads for this course can be found at the eLearning page for this unit of study.

Thermodynamics
The Thermodynamics lectures modules use the recommended reference:

Computational Physics Laboratory Manual
The computational laboratory segment of the unit is covered by:
*Intermediate Physics Computational Physics Optics Notes*, prepared by the School of Physics
Laboratory manuals can be purchased at the Co-op Bookshop.
**NB:** This resource will also be made available online.

Experimental Physics Laboratory Manual
The experimental laboratory segment of the unit is covered by:
*Intermediate Physics Experimental Notes*, prepared by the School of Physics
These notes contain descriptions of the experiments for both first and second semesters.
Laboratory manuals can be purchased at the Co-op Bookshop.
**NB:** This resource will also be made available online.

Module syllabus guidelines
There are syllabus guidelines for each of the lecture modules listing specific objectives that define what you should learn and understand about the detailed content of each chapter of the textbook (see Section 4). Understanding a term or concept means that you should be able to:

- explain its meaning in writing and give examples;
- interpret it correctly when you read or hear it;
- use it correctly in your own writing; and
- apply it correctly to examples and problems.

Web Resources
The ‘Current Student’ link on the School of Physics web page ([http://sydney.edu.au/science/physics](http://sydney.edu.au/science/physics)) provides resources to help you with your studies. Please spend time getting acquainted with this site, and the specific page relative to your unit of study. Unit webpages are provided under the University’s eLearning environment, which can be accessed from links on the Intermediate Physics webpages ([http://sydney.edu.au/science/physics/current/ipc.shtml](http://sydney.edu.au/science/physics/current/ipc.shtml)) or your MyUni
Access to MyUni and eLearning requires a Unikey username and password that is issued with your confirmation of enrolment. The University provides computer facilities in the Access Labs (http://sydney.edu.au/ict/switch/labs/).

**Email**
The University provides you with email access based on your username. We may use this email address to provide you with important information regarding this unit of study. **We expect you to periodically read your email account or to forward mail from it to an account you do read (eg. a hotmail account).**

**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 **Communication** link on the unit eLearning page.
- ask a Duty Tutor - a Duty Tutor will be assigned for the unit and available for two one-hour slots per week. The times will be advised.
- consult one of the many services provided by the University, such as the Maths Learning Centre. These can be found by choosing **Junior Physics Resources and Links** from the unit eLearning page or your MyUni pages (http://sydney.edu.au/myuni).
- email the relevant coordinator – Intermediate Physics Coordinator: A/Prof. Mike Wheatland (michael.wheatland@sydney.edu.au); Experimental Physics Coordinator: A/Prof. Kevin Varvell (kevin.varvell@sydney.edu.au); Computational Physics Coordinator: Dr Pulin Gong (pulin.gong@sydney.edu.au).

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**Providing us with feedback**
We welcome comments on all aspects of this unit. You should feel free to contact your lecturers, tutors or the coordinators (listed under "Where to go for help" above) at any time. There is also a formal opportunity for feedback at the Staff-Student Liaison meeting, held one lunch time towards the end of semester with staff and student representatives from the various units of study, including this one. Your feedback helps us improve this unit. A full review of the Physics syllabus will be completed this year, so your feedback is especially timely.

**7 Assessment Tasks**

You are responsible for understanding the University policy regarding assessment and examination, which can be found at [http://www.sydney.edu.au/ab/policies/Assess_Exam_Coursework.pdf](http://www.sydney.edu.au/ab/policies/Assess_Exam_Coursework.pdf)

**Assessment**
This unit is assessed through an examination, assignments taken throughout the semester, participation at computational physics sessions and a computational test at the end of semester, and marking of laboratory logbooks in experimental physics sessions as well as a talk and report late in the semester. **Proof of identification is required at all examinations.**

Except where otherwise noted, candidates will not be allowed to bring books or papers into the examination room. However, examinations are not meant to be tests of rote memorisation, and formula sheets will normally be included in the examination papers.

A preliminary examination timetable is released late in the semester and students are asked to report all clashes to the Student Centre (in the Jane Foss Russell Building). The final timetable may differ from the preliminary one and it is each student’s responsibility to determine the date, time and location of their scheduled examinations.
7.1 Summative Assessments

<table>
<thead>
<tr>
<th>Assessment Task</th>
<th>Percentage Mark</th>
<th>Due Date</th>
<th>Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optics - Assignment</td>
<td>3.1</td>
<td>Week 7 Thursday, 26 April 2012</td>
<td>1, 2, 4</td>
</tr>
<tr>
<td>Thermodynamics - Assignment</td>
<td>3.1</td>
<td>Week 12 Friday, 01 June 2012</td>
<td>1, 2, 4</td>
</tr>
<tr>
<td>Experimental Physics</td>
<td>31.2</td>
<td>Weekly (weeks: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11 and 12)</td>
<td>3, 4, 5, 6, 7</td>
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<tr>
<td>Computational Physics</td>
<td>6.3</td>
<td>Weekly (weeks: 2, 3, 4, 6, 7, 8, 9, 10, 11, 12 and 13)</td>
<td>1, 2, 6, 7</td>
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<tr>
<td>Computational Exam</td>
<td>16</td>
<td>Week 13 (week starting Sunday, 03 June 2012)</td>
<td>1, 2, 5, 7</td>
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<tr>
<td>Final examination: Optics</td>
<td>22.3</td>
<td>Exam Period</td>
<td>1, 2, 5, 7</td>
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<tr>
<td>Final examination: Thermodynamics</td>
<td>17.9</td>
<td>Exam Period</td>
<td>1, 2, 5, 7</td>
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Descriptions of Summative Assessments

**Optics - Assignment**
Students will submit individual assignments. Even though students may work in groups on solving the problems, the individually submitted answers must include explanations of how each individual has understood the problem and its solution. Each handed in assignment must have a cover sheet, which is available from the eLearning site. In signing the cover sheet, each student is confirming awareness of the University’s policy on plagiarism and academic honesty, and agreement to comply with that policy. Assignments will be handed in at Physics Student Services, Room 210, no later than 5pm on the due date. **Note that the due date has been delayed by one week from the originally published date. Late assignments will not be marked.**

**Thermodynamics - Assignment**
Students will submit individual assignments. Even though students may work in groups on solving the problems, the individually submitted answers must include explanations of how each individual has understood the problem and its solution. Each handed in assignment must have a cover sheet, which is available from the eLearning site. In signing the cover sheet, each student is confirming awareness of the University’s policy on plagiarism and academic honesty, and agreement to comply with that policy. Assignments will be handed in at Physics Student Services, Room 210, no later than 5pm on the due date. **Late assignments will not be marked.**

**Experimental Physics**
Assessment in the laboratory is based on successful completion of laboratory work and performance in the laboratory skills test. For each laboratory session, you are awarded a mark for successfully completing each checkpoint. Satisfactory performance in Laboratory work is necessary for a pass in the unit, but if you work well in the laboratory you will learn a lot and be well on the way to passing this unit.

7.2 Assessment Grading

Final grades in this unit are awarded at levels of **HD** (High Distinction), **D** (Distinction), **CR** (Credit), **P** (Pass) and **F** (Fail) as defined by the Academic Board Assessment Policy. These achievement levels are described below. Details of the policy are available on the University’s ‘Policy Online’ website at [http://www.sydney.edu.au/ab/policies/Assessment_Policy_2011.pdf](http://www.sydney.edu.au/ab/policies/Assessment_Policy_2011.pdf).

The assessments for this unit are described in this unit of study outline. This description includes the purpose, timing and weighting of each assessment item and an explanation of how task relate to the
learning outcomes of the unit. Students are responsible for actively engaging with these assessments, including carefully reading the guidance provided, spending sufficient time on the task, ensuring their work is authentic and their own (whether individual or group work), completing work on time and acting on feedback provided.

Assessment tasks are moderated to ensure their appropriateness, their consistency with the achievement level descriptors below and equity of grade distributions across the units offered by the Faculty of Science. In Intermediate Physics, our aim is to give everyone a chance of a high grade, irrespective of their unit of study. To achieve this, we compare student marks with student AAMs, and compare Normal and Advanced units by having some assessment tasks in common. We use this comparison to ensure one class isn't being disadvantaged by, say, a difficult assessment task. The result of this moderation process is a higher percentage of HDs and Ds in the Advanced unit (as you might expect), however the process also ensures there are HDs and Ds awarded in the other units of study to students who excel.

Grades:

**High Distinction (HD)**
At HD level, a student demonstrates a flair for the subject and comprehensive knowledge and understanding of the unit material. A ‘High Distinction’ reflects exceptional achievement and is awarded to a student who demonstrates the ability to apply subject knowledge to novel situations.

**Distinction (D)**
At D level, a student demonstrates an aptitude for the subject and a solid knowledge and understanding of the unit material. A ‘Distinction’ reflects excellent achievement and is awarded to a student who demonstrates an ability to apply the key ideas of the subject.

**Credit (CR)**
At CR level, a student demonstrates a good command and knowledge of the unit material. A ‘Credit’ reflects solid achievement and is awarded to a student who has a broad understanding of the unit material but has not fully developed the ability to apply the key ideas of the subject.

**Pass (P)**
At P level, a student demonstrates proficiency in the unit material. A ‘Pass’ reflects satisfactory achievement and is awarded to a student who has threshold knowledge of the subject.


8 Learning and Teaching Policies

**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 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 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/science/cstudent/ug/forms.shtml](http://sydney.edu.au/science/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.

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.

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**ACADEMIC DISHONESTY/PLAGIARISM**

We will NOT accept assessments that are simply copied. Copying the work of another person without acknowledgment is plagiarism and contrary to University policies on Academic Dishonesty and Plagiarism ([http://sydney.edu.au/ab/policies/Academic_Honesty_Cwk.pdf](http://sydney.edu.au/ab/policies/Academic_Honesty_Cwk.pdf)).

**Academic Dishonesty** means seeking to obtain or obtaining academic advantage (for example, in assessments) by dishonest or unfair means or knowingly assisting another student to do so. Academic Dishonesty includes, but is not limited to:

(a) recycling – that is, the resubmission for assessment of work that is the same, or substantially the same, as Work previously submitted for assessment in the same or in a different unit of study (except in the case of legitimate resubmission with the approval of the examiner for purposes of improvement);
(b) fabrication of data;
(c) the engagement of another person to complete or contribute to an assessment or examination in place of the student, whether for payment or otherwise or accepting such an engagement from another student;
(d) communication, whether by speaking or some other means, to other candidates during an examination;
(e) bringing into an examination forbidden material such as textbooks, notes, calculators or computers;
(f) attempting to read other student’s work during an examination;
(g) writing an examination or test paper, or consulting with another person about the examination or test, outside the confines of the examination room without permission;
(h) copying from other students during examinations;
(i) inappropriate use of electronic devices to access information during examinations.

Plagiarism means presenting another person’s work as one’s own work by presenting, copying or reproducing it without acknowledgement of the source. Plagiarism is a form of Academic Dishonesty, but is treated separately. Plagiarism includes presenting work for assessment, publication, or otherwise, that includes:
(a) phrases, clauses, sentences, paragraphs or longer extracts from published or unpublished work (including from the Internet) without acknowledgement of the source; or
(b) the work of another person, without acknowledgement of the source and presented in a way that exceeds the boundaries of legitimate cooperation.

UNIVERSITY POLICIES
For full details of applicable university policies and procedures, see the Policies Online site at http://sydney.edu.au/policy

Academic Policies relevant to student assessment, progression and coursework:

- **Academic Honesty in Coursework.** All students must submit a cover sheet for all assessment work that declares that the work is original and not plagiarised from the work of others. The University regards plagiarism as a form of academic misconduct, and has very strict rules that all students must adhere to. For information see the document defining academic honesty and plagiarism [http://sydney.edu.au/ab/policies/Academic_Honesty_Cwk.pdf](http://sydney.edu.au/ab/policies/Academic_Honesty_Cwk.pdf)

- **Coursework assessment and examination policy.** The faculty policy is to use standards based assessment for units where grades are returned and criteria based assessment for Pass / Fail only units. Norm referenced assessment will only be used in exceptional circumstances and its use will need to be justified to the Undergraduate Studies Committee. Special consideration for illness or misadventure may be considered when an assessment component is severely affected. This policy gives the details of the information that is required to be submitted along with the appropriate procedures and forms (see link below).

- **Special Arrangements for Examination and Assessment.** In exceptional circumstances alternate arrangements for exams or assessment can be made. However concessions for outside work arrangements, holidays and travel, sporting and entertainment events will not normally be given. Start by going to the Faculty of Science Webpage, and downloading the ‘Special Consideration’ pack [http://sydney.edu.au/science/cstudent/ug/forms.shtml#special_consideration](http://sydney.edu.au/science/cstudent/ug/forms.shtml#special_consideration)

- **Student Appeals against Academic Decisions.** Students have the right to appeal any academic decision made by a school or the faculty. The appeal must follow the appropriate procedure so that a fair hearing is obtained.