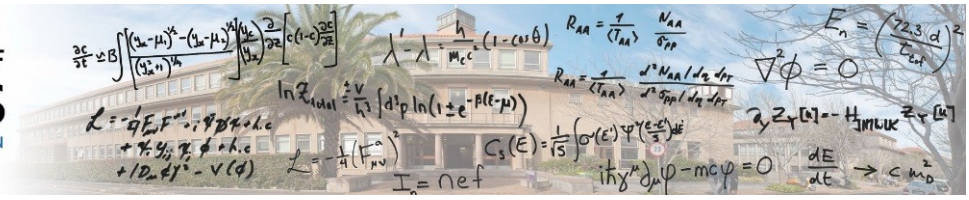
DEPARTMENT OF PHYSICS
UNIVERSITY OF CAPE TOWN



PHY1004W: *Matter and Interactions*
Course Information 2023

PHY1004W (Matter and Interactions) is the calculus-based first-year course for science students who intend to proceed to higher physics courses. It is also suitable for mathematicians, astronomers, chemists, computer scientists and geologists. Together with MAM1031F and MAM1032S (or equivalent) it is a prerequisite for the further physics course PHY2004W, which leads to the physics major. Students will normally be expected to have passed NSC Physical Science with at least 60% and Mathematics with at least 70%. First-year Mathematics courses such as MAM1031F and MAM1032S (or equivalent) must have been passed or be taken concurrently. Applied Maths I is also strongly recommended.

The course consists of approximately 120 lectures, and 24 afternoon tutorial or laboratory sessions. The PHY1004W course and laboratory convenor is: **Dr Trisha Salagaram** (Room 5.13, RW James building, trisha.salagaram@uct.ac.za).

Course outline

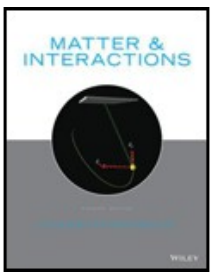
The course will cover …

- Mechanics: momentum principle, conservation of energy, energy quantization, angular momentum
- Matter: atomic nature of matter, waves and particles
- Thermodynamics: statistical physics, entropy, probability theory
- Electricity: Fields and charges, potential, circuits, Gauss' law
- Magnetism: Fields and currents, magnetic forces, Faraday's law
- Electromagnetic radiation, waves, physical optics

... with an emphasis on ... analyses of systems based on a small number of fundamental principles; the atomic nature of matter, and the link between microscopic and macroscopic phenomena; a unified treatment of topics; and modelling of complex physical systems, including the use of numerical (computer) treatments.

Lecturers

- Mechanics: Andy Buffler, Trisha Salagaram, Spencer Wheaton
- Electromagnetism: Trisha Salagaram, Steve Peterson, Andre Peshier



Textbook

The prescribed textbook is *Matter and Interactions 4th Edition*, Ruth Chabay and Bruce Sherwood, John Wiley and Sons, 2015.

Lecture venue

All lectures will be held in Lecture Theatre LT4A, RW James Building, 3rd period, 10:00 - 10:45 (Monday to Friday).

Communication

Notices, schedule changes, and other course material will be posted on the PHY1004W Amathuba site. You will also receive email correspondence from time to time, so check your UCT email regularly.

Computing
The numerical modelling of systems using a computer is a central part of the course. Instruction will be provided using the computer language Python together with the visual module. This VPython package is used in the textbook. All students are required to have their own laptop which must be brought to all activities (lectures, labs and tutorials).

Weekly problem sets

Each Friday morning a new weekly problem set will appear on Amathuba. Students are to work through all the problems (and are strongly encouraged to attempt the extra, textbook problems listed at the bottom of the sheet as well) by the end of the next week. (Students may consult with each other and approach the course tutor for help if necessary.) Full solutions to these problems must be handed in by each student on the Amathuba assignments tab set up for WPSs. Your WPS will be graded between 0 and 5 although your solutions will not be thoroughly checked. Worked solutions to the questions will be published on Amathuba for you to check your own work. Marks obtained for these weekly problem sets will contribute 5% towards the final course mark. *Note: These weekly problem sets and the tutorials are a good indicator of the type and standard of questions which can be expected in tests and exams.*

Course tutor

The course tutors for the course are Erin Jarvie and TBA, who will deal with the weekly problem sets and be available at certain times for consultation.

Plagiarism declaration.

Every student needs to read the "What is plagiarism?" document available on the course Amathuba site and complete the plagiarism declaration (available as a Amathuba Quiz) before the end of the first week.

Laboratory

Laboratory sessions for PHY1004W students take place on Tuesday afternoons from 14h00. Certain laboratory reports will be designated as writing exercises, and particular emphasis will be placed in these on writing skills. Mr Mark Christians (Preparation Room in PHYLAB1) is the Technical Officer to whom all administrative queries should be addressed in the first instance. Dr Nawahl Razak (Room 3.04) is the Chief Scientific Officer for the teaching laboratories.
There is a separate handout regarding laboratories.

Tutorials

Approximately once every four weeks, students will attend an afternoon tutorial session instead of a practical. At the start of the tutorial session a selection of about four problems will be assigned. The class will then be formed into groups of four to work through the assigned problems at a whiteboard in RW James 3B. Tutors will be present during the session.

Attendance and exemptions

Attendance at practicals, tutorials, tests and examinations is compulsory. All students are expected to attend all practical and computational laboratories for the course, and complete all laboratory reports, other homework assignments, and laboratory tests (where applicable), and attend all white board tutorials. If you are ill and miss any grade-carrying activity, then a medical certificate from a registered medical practitioner needs to be presented to Jill Patel (Room 5.07 RW James) within 2 days of returning to classes, and a short form will need to be completed (available on the PHY1004W Amathuba site). You are also required to email the course convener indicating the activities you have missed. Students missing a test due to illness will be asked by the course convener to write a make-up test within a few days. Plans will also be made to hand in missed

homework, tutorials or other assignments. Exceptions are only granted in very rare circumstances. An application for exemption from laboratory activities for students who are repeating the course must be made using the special form for this purpose (available on the PHY1004W Amathuba site) and presented to Mr. Christians in the first-year laboratory within the first two weeks of term.

Short leave from the course

If a student wishes to be granted an exemption or extension for a course requirement associated with a planned (future) short absence from the course, then there is a form to complete (available on the course Amathuba site). This form needs to be submitted to Jill Patel (Room 5.07 RW James) at least 3 working days prior to the period in question. Irreversible plans (such as flight bookings) must not be made before approval of leave is granted. Completion of the form is not required for medical certificates obtained on the day of unplanned illness.

Assessment

PHY1004W is assessed as shown below:

6	Class (theory) tests	20%
2	Laboratory tests	12%
24	Weekly problem sets	6%
many	Laboratory reports	12%
1	June Examination (2 hours)	25%
1	November Examination (2 hours)	25%

You can check your up-to-date grades for the course on Amathuba gradebook.

Duly performed (DP) requirements:

A student will be regarded as having "duly performed" the work of the course, and thus qualify to write the final examination, if he/she has met the DP requirements for this course. DP certificates may be withheld from students who fail to meet these minimum requirements. Students who are not awarded DP certificates will not be permitted to write the final examination. The DP list will be published no later than one calendar week before the last teaching day of the course, and all grades recorded on that day will be used to consider the DP status of each student. Grades recorded after this date will be used in cases of appeal when a DP is not awarded. An appeal against a DP not being awarded is first made to the course convener, and thereafter potentially to the Head of Department (by email). The following are the **DP requirements for this course:**

1. A minimum of 35% overall for the coursework component of the course (as determined one week before the last teaching day of the course).
2. Attendance at all class tests. Students missing a test for medical reasons will be required to write a make-up within three days of returning to classes, in consultation with the course convener.
3. A minimum of 50% for the laboratory component of the course.

General communication

Keep an eye out for meetings of the ***Society of Physics Students***.
The main physics website may be useful http://www.phy.uct.ac.za
… as well as our departmental Facebook page: https://www.facebook.com/uctphysics
There is also a suggestion box in the RW James foyer.

UCT Physics Department
PHY1004W Lecture schedule 2023

Week	Date	Mon	Tue	Wed	Thu	Fri
1	Feb 13 - 17	Mech	Mech	Mech	Mech	Mech
2	Feb 20 - 24	Mech	Mech	Mech	Mech	Mech
3	Feb 27 - Mar 3	Mech	Mech	Mech	Mech	Mech
4	Mar 6 - 10	Mech	Mech	Mech	Mech	Mech
5	Mar 13 - 17	[test day]	**Test 1**	Mech	Mech	Mech
6	Mar 20 - 24	Mech	[Human]	Mech	Mech	Mech
7	Mar 27 - 31	vac	vac	vac	vac	vac
8	Apr 3 – Apr 7	Mech	Python	Python	Python	[Easter]
9	Apr 10 - 14	[Easter]	Mech	Mech	Mech	Mech
10	Apr 17 - 21	Mech	Mech	Mech	Mech	**Test 2**
11	Apr 24 - 28	Mech	Mech	Mech	[Freedom]	Mech
12	May 1 - May 5	[Workers]	Mech	Mech	Mech	Mech
13	May 8 - 12	Mech	Mech	Mech	Mech	Mech
14	May 15 - 19	Mech	Mech	Mech	Mech	**Test 3**
15	May 22 …	swot	swot	swot	swot	swot
		Exams ...	… then …	… vacation		
1	Jul 24 -28	EM	EM	EM	EM	EM
2	Jul 31 – Aug 4	EM	EM	EM	EM	EM
3	Aug 7 - 11	EM	EM	[Women]	EM	EM
4	Aug 14 – 18	EM	EM	EM	EM	EM
5	Aug 21 - 25	EM	EM	EM	EM	**Test 4**
6	Aug 28 – Sep 1	EM	EM	EM	EM	EM
7	Sep 4 - 8	vac	vac	vac	vac	vac
8	Sep 11 - 15	EM	EM	EM	EM	EM
9	Sep 18 - 22	EM	EM	EM	EM	EM
10	Sep 25 - 29	[Heritage]	EM	EM	EM	**Test 5**
11	Oct 2 - 6	EM	EM	EM	EM	EM
12	Oct 9 - 13	EM	EM	EM	EM	EM
13	Oct 16 - 20	EM	EM	EM	EM	EM
14	Oct 23 - 27	EM	**Test 6**	swot	swot	swot
		Exams ...				

AB	TS	SMW	SP	AP