

PHY1004W: *Matter and Interactions* Course Information 2021

First semester edition (may be updated for the second semester)

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 MAM1000W it is a prerequisite for the further physics course PHY2004W, and then PHY3004W 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%. A full first-year Mathematics course such as MAM1000W (or equivalent) must have been passed or be taken concurrently. Applied Maths I is also strongly recommended.

Due to the ongoing COVID-19 pandemic, this course will be delivered online, mainly through Vula. Meetings and tutorials will take place on Zoom from time-to-time. The laboratory component will be delivered in an entirely do-at-home format. Tests will be delivered through Vula. However, all students need to be available to write the June and November exams, in person, on campus.

All students in this course are expected to have a laptop and a stable internet connection for all aspects of the course.

The course consists of approximately 120 “lectures”, and 24 tutorial or laboratory sessions. The PHY1004W course convenor is: **Prof Andy Buffler**, (andy.buffler@uct.ac.za) in the first semester and **Dr Katie Cole** (katie.cole@uct.ac.za) in the second semester.

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, Ampere's Law, Faraday's Law
- Electromagnetic radiation, waves, physical optics

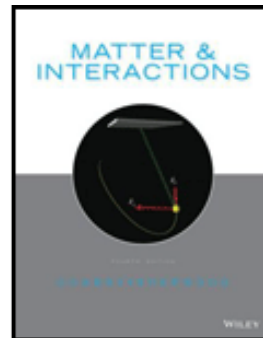
... with an emphasis on ... analyses of systems based on a small number of fundamental principles; the atomic nature of matter, and the link between microscopic and macroscopic phenomena; a unified treatment of topics; and modelling of complex physical systems, including the use of numerical (computer)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

Lecturers

- Mechanics: Andy Buffler, Spencer Wheaton
- Electromagnetism: Katie Cole, Steve Peterson, Andre Peshier

Textbook

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



Lectures

All “lectures” will be delivered on the Lessons platform on Vula.

Computing

The numerical modelling of physical systems using a computer is a central part of the course. Instruction will be provided using the computer language Python (version 3.8.1) together with the visual module. This [VPython](#) package is used in the textbook. All students are required to have their own laptop with Python and VPython installed. There is a separate document dealing with installing Python and VPython.

Weekly problem sets

Each Friday morning a new weekly problem set will appear on Vula. 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 Vula 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 Vula 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 tutors

The course tutors for the course are **Erin Jarvie** and **Hannah Clayton** who will deal with the weekly problem sets and be available at certain times for consultation online.

Communication

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

Laboratory

Dr Trisha Salagaram (trisha.salagaram@uct.ac.za) is the coordinator of the PHY1004W laboratory in the first semester, and **Dr Katie Cole** (katie.cole@uct.ac.za) in the second semester. Laboratory sessions for PHY1004W students take place on Tuesday afternoons from 14h00 and be delivered through Vula. Certain laboratory reports will be designated as writing exercises, and particular emphasis will be placed in these on writing skills. There is a separate handout regarding laboratories.

Tutorials

Approximately once every four weeks, students will partake in a tutorial session instead of a practical. A selection of about four problems will be assigned. More details will follow later.

Assessment

PHY1004W is assessed as shown below:

6	Class (theory) tests	20%
2	Laboratory tests	10%
24	Weekly problem sets	5%
many	Laboratory reports	15%
1	June Examination (2 hours)	25%
1	November Examination (2 hours)	25%

You can check your up-to-date grades for the course on Vula 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 in November. 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. Participation in all class tests. Students missing a test for medical reasons will be required to write a make-up within three days of returning from illness, in consultation with the course convener.
3. A minimum of 50% for the laboratory component of the course.

Attendance and exemptions

Participation in all practicals, tutorials, tests and examinations is compulsory. All students are expected to attempt all practical and computational laboratories for the course, and complete all laboratory reports and laboratory tests, and attend all tutorials. If you are ill and miss any grade-carrying activity, then a medical certificate from a registered medical practitioner needs to be emailed to Jill Patel (jill.patel@uct.ac.za) within 2 days of returning from illness, and a short form will need to be completed (available on the PHY1004W Vula 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. 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 Vula site) and emailed to Mr. Mark Christians in the first-year laboratory within the first two weeks of term (mark.christians@uct.ac.za).

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 Vula site). This form needs to be emailed to Jill Patel (jil.patel@ut.ac.za) 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.

Working at home

Working at home is not what you hoped for this year. It is also not what we want as lecturing staff. We love to see you all and work with you. However, these are extraordinary times and we need to make the best of things in this mode of teaching. There will be surprises that neither you nor we thought of. There will be unexpected stresses in your lives. Please work with us to help you engage best with the course. Tell us what you think works best and we will try to adapt things.

We will be asking all of you to agree to this Code of Honour for the course. We will assume that everything you do for formal assessment will be your own work and that you did not solicit help from others.

Faculty of Science Code of Honour

The University of Cape Town's official statement of general rules and policies, including a statement of values and expected student and staff conduct, can be found here:

http://www.students.uct.ac.za/sites/default/files/image_tool/images/434/study/handbooks/2020/UCT_Handbook_3_2020.pdf

All staff and students in the Faculty of Science are required to familiarise themselves with UCT's rules and policies.

The Faculty of Science takes UCT's statement of values seriously. Among other things, every member of the Faculty of Science – student and staff – is expected to strive for personal and academic integrity; to be respectful and tolerant towards others; to honour the rights, personal choices and property of others; to take responsibility for their behaviour individually and in groups; and generally to act as a responsible citizen in our academic community and beyond. As stated in the above-mentioned document: “Truth, fairness, consistency and integrity in both academic and other work, and in all personal and institutional relationships” are key elements of UCT's academic values.

We are currently in a global crisis and recognise that distance learning will be a challenge for many students. Nonetheless, we must strive to uphold these values. We ask students to commit to this Code of Honour (i.e. doing what is morally right) when completing tasks remotely: all assignments and tests must be a student's own work, with no input from others (unless otherwise specified), and no work can be plagiarised.

Students may report to their course convener or Science Faculty if they believe that other UCT students have breached this code. The Faculty of Science commits to supporting our students in this difficult time and requests their full commitment to the integrity of the academic project.

Please commit to this by completing the “Code of Honour” Quiz on the PHY1004W Vula site.

UCT Physics Department

PHY1004W “Lecture” schedule 2021

Week	Date	Mon	Tue	Wed	Thu	Fri
1	Mar 15 - 19	Mech1	Mech1	Mech1	Mech1	Mech1
2	Mar 22 - 26	[Hum Rights]	Mech1	Mech1	Mech1	Mech1
3	Mar 29 - Apr 2	Mech1	Mech1	Mech1	Mech1	[Easter]
4	Apr 5 - 9	[Easter]	Mech1	Mech1	Mech1	Mech1
5	Apr 12 - 15	Mech1	Mech1	Mech1	Mech1	Mech1
6	Apr 19 - 23	[test day]	Test 1	Mech1	Mech1	Mech1
7	Apr 26 - 30	Mech1	[Freedom]	Mech1	Mech1	Mech1
8	May 3 - 7	vac	vac	vac	vac	vac
9	May 10 - 14	VPython	VPython	VPython	Mech2	Mech2
10	May 17 - 21	Mech2	Mech2	Mech2	Mech2	Mech2
11	May 24 - 28	Test 2	Mech2	Mech2	Mech2	Mech2
12	May 31 - Jun 4	Mech2	Mech2	Mech2	Mech2	Mech2
13	Jun 7 - 11	Mech2	Mech2	Mech2	Mech2	Mech2
14	Jun 14 - 18	Mech2	Mech2	[Youth]	Mech2	Test 3
15	June 21 ...	swot	swot	exams	exams	exams
		More exams then vacation		
1	Aug 2 - 6	EM1	EM1	EM1	EM1	EM1
2	Aug 9 - 13	[Women]	EM1	EM1	EM1	EM1
3	Aug 16 - 20	EM1	EM1	EM1	EM1	EM1
4	Aug 23 - 27	EM1	EM1	EM1	EM1	EM1
5	Aug 30 - Sep 3	EM2	EM2	EM2	EM2	EM2
6	Sep 6 - 10	Test 4	EM2	EM2	EM2	EM2
7	Sep 13 - 17	EM2	EM2	EM2	EM2	EM2
8	Sep 20 - 24	vac	vac	vac	vac	[Heritage]
9	Sep 27 - Oct 1	EM2	EM2	EM2	EM2	EM2
11	Oct 4 - 8	EM2	EM2	EM3	EM3	EM3
12	Oct 11 - 15	Test 5	EM3	EM3	EM3	EM3
13	Oct 18 - 22	EM3	EM3	EM3	EM3	EM3
14	Oct 25 - 29	EM3	EM3	EM3	EM3	EM3
15	Nov 1 - 5	Test 6	swot	swot	exams	exams
16	Nov 8 ...	Exams ...				

AB	SMW	KC	SP	AP
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