PHY1004W: *Matter and Interactions*
Course Information 2025

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. It is a prerequisite for the further physics course PHY2004W, which leads to the physics major course PHY3004W.

Pre/co-requisites

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 MAM1031F + MAM1032S must be taken concurrently. MAM1043H and MAM1044H are also strongly recommended.

Course convener

Prof Andy Buffler (Room 5.01, RW James Building, andy.buffler@uct.ac.za).

Lecturers

First semester: Andy Buffler, Trisha Salagaram, Spencer Wheaton
Second semester: Trisha Salagaram, Dieter Geduld, Will Horowitz

Laboratory convener

Dr Trisha Salagaram (Room 5.12, RW James Building, trisha.salagaram@uct.ac.za).

Course tutors

Miles Kidson (KDSMIL001@myuct.ac.za) and *****
They will deal with the weekly problem sets and be available at certain times for consultation.

Course outline

The course is divided into two broad themes (Modern Mechanics and Electromagnetism) which covers …
- 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 (computational) treatments.

Lecture venue

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

Textbook

The prescribed textbook is *Matter and Interactions* 4th Edition,
Ruth Chabay and Bruce Sherwood, John Wiley and Sons, 2015.
The lectures follow the textbook very closely.
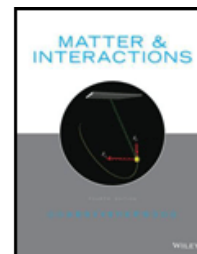
Communication

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 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.*

Plagiarism declaration

Every student needs to read the lesson on plagiarism available on the course Amathuba site and complete the plagiarism declaration (available as a Amathuba Quiz) before the end of the first week. The use of generative AI is a form of plagiarism and should not be used in any form in any assignments unless explicitly requested in the task. The Physics Department will make use of plagiarism detection software in order to evaluate academic integrity, including the use of generative AI.

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. The lab coordinator is Dr Trisha Salagaram. *There is a separate communication regarding laboratories.*

Tutorials

Approximately once every four weeks, students will attend an afternoon tutorial session in RW James 3B 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 three to work through the assigned problems at a whiteboard. Tutors will be present during the session.

Class tests

There are 5 class tests which are written in PHYLAB1. Class Test 1 is slightly longer and forms part of the Science Faculty test days in the first term.

Formula sheets

A standard formula sheet for each semester (Modern Mechanics and Electromagnetism) will be provided and may be used in all class tests and both examinations.

Assessment

PHY1004W is assessed as shown below:

5 x class (theory) tests	20%
Weekly problem set record	6%
Laboratory report record	12%
2 x laboratory tests	12%
June examination (2 hours) First semester topics	25%
November examination (2 hours) Second semester topics only	25%

You can check your up-to-date grades for the course on Amathuba. A final (aggregate) mark of 50% is required to pass the course. There is no sub-minimum for the two examinations.

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.

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.

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.

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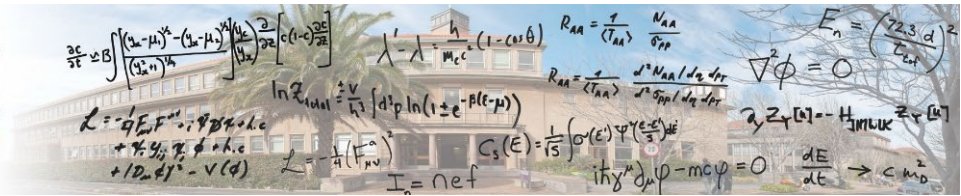
PHY1004W lecture and class test schedule 2025

[MM: Modern Mechanics; EM: Electromagnetism]

Week	Date	Mon	Tue	Wed	Thu	Fri
8	Feb 17 - 21	MM	MM	MM	MM	MM
9	Feb 24 - 28	MM	MM	MM	MM	MM
10	Mar 3 - 7	MM	MM	MM	MM	MM
11	Mar 10 - 14	MM	MM	MM	MM	MM
12	Mar 17 - 21	[test day]	**Test 1**	MM	MM	[Hum R]
13	Mar 24 - 28	MM	MM	MM	MM	MM
14	Mar 31 - Apr 4	break	break	break	break	break
15	Apr 7 - 11	MM	MM	MM	MM	MM
16	Apr 14 - 18	Python	Python	Python	Python	[Easter]
17	Apr 21 - 25	[Easter]	MM	MM	MM	MM
18	Apr 28 - May 2	[(Freedom)]	MM	MM	[Workers']	MM
19	May 5 - 9	MM	MM	MM	MM	MM
20	May 12 - 16	MM	**Test 2**	MM	MM	MM
21	May 19 - 23	MM	MM	MM	MM	MM
22	May 26 …	swot	swot	swot	then	exams
		exams ...	… then …	… vacation		
31	Jul 28 - Aug 1	EM	EM	EM	EM	EM
32	Aug 4 - 8	EM	EM	EM	EM	EM
33	Aug 11 - 15	EM	EM	EM	EM	EM
34	Aug 18 - 22	EM	EM	EM	EM	EM
35	Aug 25 - 29	EM	EM	EM	EM	**Test 3**
36	Sep 1 - 5	EM	EM	EM	EM	EM
37	Sep 8 - 12	break	break	break	break	break
38	Sep 15 - 19	EM	EM	EM	EM	EM
39	Sep 22 - 26	EM	EM	[Heritage]	EM	EM
40	Sep 29 - Oct 3	EM	EM	EM	EM	**Test 4**
41	Oct 6 - 10	EM	EM	EM	EM	EM
42	Oct 13 - 17	EM	EM	EM	EM	EM
43	Oct 20 - 24	EM	EM	EM	EM	EM
44	Oct 27 - 31	**Test 5**	swot	swot	swot	swot
45	Nov 3 …	swot	swot	then …	exams	

AB	TS	SMW	TS	DRG	WAH