

PHY2004W: *Intermediate Physics* Course Information 2024

PHY2004W is the second-year course which forms part of the major in Physics at UCT.

Pre/co-requisites

Pre-requisites: PHY1004W, and a full first year course in Mathematics.

Co-requisite: MAM2010F, MAM2011F, MAM2013S and MAM2014S; or MAM2010F, MAM2011F, MAM2040F and MAM2043S.

A final mark of 60% and higher in PHY1004W is highly recommended.

Course convener

First semester: Prof Andy Buffler (Room 5.01, RW James building, andy.buffler@uct.ac.za)

Second semester: Dr Mawande Lushozi (Room 4.11, RW James building, mawande.lushozi@uct.ac.za)

Lecturers

First semester: Andy Buffler, James Keaveney

Second semester: Mawande Lushozi, Trisha Salagaram, Spencer Wheaton

Laboratory convener

Prof Mark Blumenthal (Room 5.03, RW James building, mark.bumenthal@uct.ac.za).

Course tutors

Rayhaan Perin (prnmog001@myuct.ac.za); Stephan Potgieter (ptgjak001@myuct.ac.za); and

Faaris Alam (almmoh008@myuct.ac.za)

They will deal with the weekly problem sets and be available at certain times for consultation.

All queries regarding WPS grades and other tutoring matters are directed first to Rayhaan.

Course outline

Vibrations and Waves (VW) (22 lectures): Simple harmonic motion; damping; complex numbers; forced oscillations and resonance; coupled oscillators; mechanical waves; normal modes of different systems in 1D and 2D; Fourier analysis; travelling waves; sound; interference and diffraction.

Vector Calculus (VC) (7 lectures): Div, grad and curl; line integrals; surface integrals; volume integrals; Gauss' theorem; Stokes' theorem.

Classical Mechanics and Special Relativity (MEC) (31 lectures): Brief review of Newtonian mechanics; Stationary-action principle; The Euler-Lagrange equation; Lagrangian mechanics; Constrained systems; Symmetries; Conservation laws and cyclic coordinates; Noether's Theorem; Hamiltonian mechanics; Non-inertial reference frames, Centrifugal and coriolis forces; Special relativity; Time dilation; Length contraction; Lorentz transformation; Four-vectors; Lorentz invariants; The light cone and causality.

Electromagnetism (EM) (30 lectures): Electrostatics; special techniques for potentials; electric fields in matter; magneto-statics; magnetic fields in matter; current; Ohm's Law; electromagnetic induction; electrodynamics; Maxwell's equations.

Quantum Mechanics (QM) (30 lectures): The basic assumptions of quantum mechanics; solutions of Schrödinger's equation; properties of wave functions and operators; one-dimensional applications; angular momentum in quantum mechanics; three-dimensional applications; the hydrogen atom; approximate methods.

Lecture venue

All lectures will be held in Lecture Theatre LT4B, RW James Building, 4th period, 11:00 - 11:45 (Monday to Friday).

Prescribed textbooks

Vibrations and Waves, A.P. French, (M.I.T. Introductory Physics Series, Van Nostrand).

Classical Mechanics, John R. Taylor (University Science Books, 2005).

Introduction to Electrodynamics (4th edition), D.J. Griffiths (Pearson, 2013).

Introduction to Quantum Mechanics (2nd edition), D.J. Griffiths (Pearson, 2005).

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. 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 10% 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*

Laboratory

Laboratory sessions for PHY2004W take place every Monday afternoon at 14:00 in PHYLAB2. They include both experimental activities and computational activities featuring Python. *There is a separate communication regarding laboratories.*

Tutorials

Whiteboard tutorial sessions take place every Tuesday afternoon at 14:00 in RW James 3B. At the start of the tutorial session a selection of about four problems will be assigned. The class will be split into groups of three to work through the assigned problems at a whiteboard. Tutors will be present during the session. No memo will be provided for these problems.

Class tests

There will be two class tests in each semester. They will take place on Tuesday afternoons at 14:00 in PHYLAB2. No tutorial will be scheduled on the day of a class test.

Assessment

PHY2004W is assessed as shown below:

4 x class (theory) tests	20%
Weekly problem set record	10%
Laboratory record	20%
June examination (3 hours) First semester topics	25%
November examination (3 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 a sub-minimum criterion of 40% in each of the two examinations (see Science Faculty Handbook 2024). Any student who scores below 50% for the June examination will be required to complete a 3-hour reassessment on the first Tuesday of Semester 2. The result of this reassessment, which will be capped at 50%, will replace the June examination result if this reassessment result is higher than the mark scored in the June examination. Any student still short of the 40% exam subminimum will then need to deregister from the course, since no further reassessment of Semester 1 material will be offered. Any student awarded a deferred exam at mid-year will also need to sit the reassessment on the first Tuesday of Semester 2.

Formula sheets

Students may bring a self-generated formula sheet of 2 double-sided A4 pages to all tests and 3 double-sided A4 pages to both examinations. This may include the standard formula sheet for VW which will be provided.

Attendance and exemptions

Attendance at laboratories, 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 PHY2004W 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 PHY2004W 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.

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 40% 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, all Monday laboratory sessions and all Tuesday tutorial sessions;
3. A minimum of 50% overall for the laboratory component; and
4. Submission of all laboratory reports.

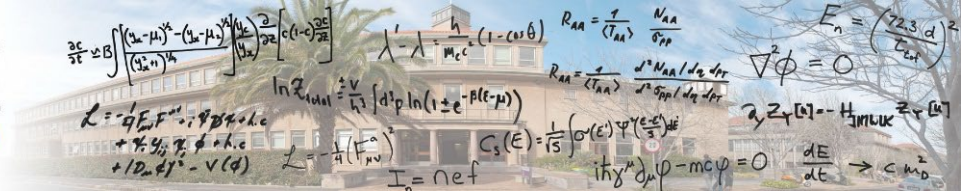
Students missing a test for medical reasons will be required to write a make-up within three days of returning to classes, in consultation with the course convener.

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.

Communication

Notices, schedule changes, and other course material will be posted on the PHY2004W Amathuba site. You will also receive email correspondence from time to time, so check your UCT email regularly.



PHY2004W lecture and class test schedule 2024

Week	Date	Mon	Tue	Wed	Thu	Fri
7	Feb 12 - 16	VW	VW	VW	VW	VW
8	Feb 19 - 23	VW	VW	VW	VW	VW
9	Feb 26 - Mar 1	VW	VW	VW	VW	VW
10	Mar 4 - 8	VW	VW	VW	VW	VW
11	Mar 11 - 15	VW	VW	VC	VC	VC
12	Mar 20 - 24	VC	VC	VC	[Hum R]	VC
13	Mar 25 - 29	vac	vac	vac	vac	[Easter]
14	Apr 1 – Apr 5	[Easter]	MEC	MEC	MEC	MEC
15	Apr 8 - 12	MEC	MEC CT1	MEC	MEC	MEC
16	Apr 15 - 19	MEC	MEC	MEC	MEC	MEC
17	Apr 22 - 26	MEC	MEC	MEC	MEC	MEC
18	Apr 29 - May 3	MEC	MEC	[Workers]	MEC	MEC
19	May 6 - 10	MEC	MEC CT2	MEC	MEC	MEC
20	May 13 - 17	MEC	MEC	MEC	swot	swot
21	May 20 ...	swot	swot	swot	exams	exams
		exams then vacation		
30	Jul 22 -26	EM1	EM1	EM1	EM1	EM1
31	Jul 29 – Aug 2	EM1	EM1	EM1	EM1	EM1
32	Aug 5 - 9	EM1	EM1	EM1	EM1	[Women]
33	Aug 12 – 16	EM2	EM2	EM2	EM2	EM2
34	Aug 19 - 23	EM2	EM2	EM2	EM2	EM2
35	Aug 26 - 30	EM2	EM2	EM2	EM2	EM2
36	Sep 2 - 6	vac	vac	vac	vac	vac
37	Sep 9 - 13	QM	QM	QM	QM	QM
38	Sep 16 - 20	QM	QM CT3	QM	QM	QM
39	Sep 23 - 27	QM	[Heritage]	QM	QM	QM
40	Sep 30 - Oct 4	QM	QM	QM	QM	QM
41	Oct 7 - 11	QM	QM	QM	QM	QM
42	Oct 14 - 18	QM	QM CT4	QM	QM	QM
43	Oct 21 - 25	QM	QM	swot	swot	swot
44	Oct 28 ...	swot	swot	exams ...		

AB	JK	ML	TS	SMW
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CT1 Class Test 1 [VW+VC]
 CT2 Class Test 2 [MEC]
 CT3 Class Test 2 [EM]
 CT4 Class Test 4 [QM]

9 April, 14:00, PHYLAB2
 7 May, 14:00, PHYLAB2
 17 Sept, 14:00, PHYLAB2
 15 Oct, 14:00, PHYLAB2