

**UNIVERSITY OF CAPE TOWN**  
**Department of Physics**  
**PHY2004W Intermediate Physics 2023**

**Instructors** Dr Spencer Wheaton (**Course Convener**) (QM) : spencer.wheaton@uct.ac.za  
A/Prof Mark Blumenthal (Lab) : mark.blumenthal@uct.ac.za  
Prof Andy Buffler (VW, VC) : andy.buffler@uct.ac.za  
Dr James Keaveney (CM) : james.keaveney@uct.ac.za  
Dr Mawande Lushozi (EM Part 1) : mawande.lushozi@uct.ac.za  
A/Prof Steve Peterson (EM Part 2): steve.peterson@uct.ac.za

**Course Tutors** The course tutors can be consulted at times still to be arranged if you have problems with the course material or the weekly problem sets.  
Rayhaan Perin / prnmog001@myuct.ac.za  
Stephan Potgieter / ptgjak001@myuct.ac.za  
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**Pre-/Co-requisites** PHY1004W, a full first year course in Mathematics, and MAM2000W or (MAM2004H and MAM2047H) as co-requisite. A final mark of 60% and higher in PHY1004W is highly recommended.

**Website** Course material and announcements will be posted on Vula.

**Syllabus** **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.  
**Vector Calculus (VC)** (7 lectures):  
Div, grad and curl; line integrals; surface integrals; volume integrals; Gauss' theorem; Stokes' theorem.  
**Classical Mechanics (CM)** (31 lectures):  
Euler's equation; Lagrange's equation; generalised coordinates and constrained systems; systems of particles; rigid bodies; coupled oscillators; special relativity; relativistic mechanics.  
**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.

**Textbooks** **Vibrations and Waves**  
VIBRATIONS and WAVES by A.P. French, (M.I.T. Introductory Physics Series, Van Nostrand).  
**Classical Mechanics**  
CLASSICAL MECHANICS by John R. Taylor (University Science Books, 2005).  
**Electromagnetism**  
INTRODUCTION to ELECTRODYNAMICS (4th edition) by D.J. Griffiths (Pearson, 2013).  
**Quantum Mechanics**  
INTRODUCTION to QUANTUM MECHANICS (2nd edition) by D.J. Griffiths (Pearson, 2005).

<b>Lectures</b>	RW James LT4B, 11h00 - 11h45, Monday to Friday.
<b>Laboratory</b>	RW James PHYLAB2, 14h00 - 17h00, Monday. <b>Practicals will start in the first week of Term 1 on Monday 13 February in PHYLAB2. A detailed schedule will be provided on Vula.</b>
<b>Tutorials</b>	RW James 3B and PHYLAB1, 14h00 - 17h00, Tuesday. <b>Tutorials will start in the first week of Term 1 on Tuesday 14 February in RW James 3B.</b>
<b>Problem Sets</b>	At the start of both semesters a weekly problem set (WPS) will be issued on the first Monday for submission through Vula on the first Friday at 11h00. Thereafter each week on Friday a problem set will be issued that is due on the following Friday at 11h00 via Vula. The WPS are part of the DP requirements and count 10% towards the final mark.
<b>Class Tests</b>	There will be two class tests in each semester. They will take place on Tuesday afternoons at 14h00 in PHYLAB2. No tutorial is scheduled for the day of a class test.
<b>Assessment</b>	The final grade for the course will be a weighted average of: Class Tests (20%), Problem Sets (10%), Laboratory Record (20%), June 3-Hour Exam (25%), November 3-Hour Exam (25%). A final (aggregate) mark of 50% is required to pass the course. <b>There is a sub-minimum criterion of 40% in each of the two examinations.</b> (see Science Faculty Handbook 2023). Any student who scores below 50% for the June Exam 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 Exam result if this reassessment result is higher than the mark scored in the June Exam. 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.
<b>Formula Sheets</b>	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.
<b>DP Certificates</b>	In order to obtain a duly performed (DP) certificate (i.e. to qualify to write the final exam) students must have obtained an average of 40% for the class record (a weighted combination of the class tests, lab record and problem sets), must have attended <b>ALL</b> lab sessions, tutorials and tests and must have submitted <b>ALL</b> lab reports.

**Exemptions** Participation in all practicals, tutorials, tests and examinations is compulsory. All students are expected to attempt all experimental 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 PHY2004W 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 by email to A/Prof Mark Blumenthal within the first two weeks of Term 1 (mark.blumenthal@uct.ac.za). If a student wishes to be granted an exemption or extension for a course requirement associated with a planned short absence from the course, then there is a form to complete (Science Faculty short leave form available on the course Vula site). This form needs to be submitted to the course convenor 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.

**Plagiarism** The real criterion is this: work that you hand in for credit is work that you must yourself understand. If copying from others is detected, the work of both the copier and the copied will not be marked, and a mark of zero will be awarded to each, and university disciplinary procedures may be invoked. Submitting the solutions taken from the solutions posted on the website by the class tutor in previous years also constitutes copying. 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 in UCT Handbook 3. Please commit to this by completing the "Code of Honour" Quiz on the PHY2004W Vula site.