

UNIVERSITY OF CAPE TOWN: DEPARTMENT OF PHYSICS
PHY2010S COURSE INFORMATION SHEET (2024)

Description: PHY2010S is second semester course which aims to present concepts of semiconductors and electromagnetism to a second year engineering undergraduate.

Pre-requisites: PHY1012F and PHY1013S or equivalent; a full first year mathematics course.

Co-requisites: MAM2083F/S second year mathematics course.

Lectures:

Lectures are held Mondays, Tuesdays, Wednesdays and Fridays in the second period (09h00 – 09h45) in lecture theatre LT4A (RW James Building) during the second semester. A register of attendance will be kept.

Lecturers	Email	Topic	Consultation Times
Prof. Mark Blumenthal	mark.blumenthal@uct.ac.za	Semiconductor Physics	Wednesday 13h30-15h00
Dr Tom Leadbeater	tom.leadbeater@uct.ac.za	Electrodynamics	Wednesday 13h30-15h00
Dr Daphney Bucher	daphney.bucher@uct.ac.za	Magnetism	Wednesday 13h30-15h00

Course tutors

Mr Linda Shelembe	shllin007@myuct.ac.za	All	Wednesday 13h30-15h00
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Prescribed Textbook: D.J. Griffiths, *Introduction to Electrodynamics*, 3rd or 4th edition Pearson / Prentice-Hall. Essential materials will be made available on amathuba.

Course outline:

Semiconductor Physics:	Quantum mechanics fundamentals, energy quantisation, Drude model, quantum transport model, charge carriers, band gaps. the p-n junction, the diode and transistor
Electrodynamics:	Vector calculus (div, grad, and curl), Dirac delta functions. Coulomb's law, Gauss' law, Poisson's & Laplace's equations, electric fields in matter, Ohm's law, currents, circuits
Magnetism:	Magnetic fields in matter, Biot-Savart law, Ampere's law, electromagnetic induction, Poynting's theorem, electromagnetic waves in vacuum

Communication: The course content will be provided on amathuba. You are required to consult the course amathuba site regularly.

Class Tests: Three class tests will be held during the semester. Provisional dates are 16 August, 13 September and 11 October. Class tests will be held from 09h00 until 09h45. The class test venue will be PHYLAB I. Attendance is compulsory in order to fulfil DP requirements.

Laboratories: There is a separate document dealing with the lab course.

Weekly Problem Sets (WPS): Weekly homework problems will be issued once a week (on a Friday) using the amathuba Test & Quizzes tool. Submission will be the following Friday. Solutions will be posted and no late submissions will be possible. Weekly problem sets will be graded for completeness as apposed to correctness. 80% of all problem sets need to be submitted to receive DP.

Assessment: There is a sub-minimum requirement of 45% in the final examination. The pass mark is 50% for the course aggregate, calculated as: Class tests (x3) 20%, Lab reports (x3) 20%, WPS (x10) 10%, Oct/Nov Exam 50%.

Duly Performed (DP) requirements: To be awarded a DP for this course students must have

- participated in all class tests with an overall average of at least 40%,
- submitted of all lab activities, with an overall average of at least 50%, and
- submitted of at least 80% of the WPSs.

PHY2010S Lecture Schedule (2023):

Week	Date	Weekly outline	Tests
1	22 - 26 July	Semiconductors	
2	29 July - 02 Aug	Semiconductors	
3	05 - 09 Aug	Semiconductors	
4	12 - 16 Aug	Semiconductors	Class test 1 (16 Aug, 09h00-09h45, PHYLAB I)
5	19 - 23 Aug	Electrodynamics	
6	26 - 30 Aug	Electrodynamics	
7	02 - 06 Sep	Vacation	
8	9 - 13 Sep	Electrodynamics	Class test 2 (13 September, 09h00-09h45, PHYLAB I)
9	16 - 20 Sep	Electrodynamics	
10	23 - 27 sep	Magnetism	
11	30 Sep - 4 Oct	Magnetism	
12	07 - 11 Oct	Magnetism	Class Test 3 (11 Oct, 09h00-09h45, PHYLAB I)
13	14 - 18 Oct	Magnetism	
14	21 - 22 Oct	Magnetism	