Academic Year	2023/24	**Semester**	1
Course Coordinator	KOH TECK SENG		
Course Code	CY1308		
Course Title	PHYSICS		
Pre-requisites	NIL		
Mutually Exclusive	PH1011, PH1012, PH1104		
No of AUs	3		
Contact Hours	1.5 hr – lecture (online); 1.5 hr – tutorial		
Proposal Date	June 2023		

Course Aims

This first year core course in the CN Yang programme aims to develop students' understanding of fundamental physical concepts in the topics of mechanics, electricity, magnetism and thermodynamics, which are applicable to science, mathematics and engineering specialisations. In addition, the course contains special topics which highlight the connection between Physics and other disciplines.

Intended Learning Outcomes (ILO)

By the end of this course, you (as a student) would be able to:

Broadly,

- Explain and apply fundamental physics principles to solve problems involving mechanics, electricity and magnetism, and thermodynamics.
- Illustrate appropriate physical phenomena related to the topics covered and communicate scientifically accurate explanations of such phenomena.

Specifically, by topic:

(1) Mechanics

a. apply conservation principles to explain physical phenomena.
b. apply concepts, definitions and laws involving linear and rotational motion to explain and solve problems in equilibrium and non-equilibrium situations.
c. Understand and apply fluid mechanics equations to simple problems, and appreciate the connections with motion of biological entities in fluid media.

(2) Electricity and Magnetism

a. apply the concept of a field of force and its related field quantities to solve problems involving electric and gravitational fields.
b. apply fundamental laws involving electricity and magnetism (e.g. Gauss' Law, Coulomb's Law, Ampere's Law, Biot-Savart Law, Faraday's Law, Lenz's Law, etc) to explain or analyse electrical and magnetic phenomena.
c. apply electromagnetism concepts and laws to analyse and solve problems involving chemical bonding and intermolecular interactions.
d. apply circuit concepts and rules (e.g. Kirchhoff's Laws, resistance, capacitance and inductance) to solve static and time-dependent circuits.
e. Explain microscopic phenomena in terms of charge to macroscopic circuit quantities (e.g. current, resistance capacitance, etc.)

(3) Thermodynamics

a. Appreciate and use fundamental laws and concepts (e.g. the zeroth law of thermodynamics, temperature, heat, thermal equilibrium, etc.) to explain or analyse thermodynamics phenomena qualitatively.
b. Identify and explain the connections between thermodynamics and climate change.

(4) Modelling
a. Carry out simple experiments to perform observations of, analyse and explain actual physical situations.
b. Communicate relevant scientific information with clarity, critical thought and creativity.

(5) Special topics: Interdisciplinary connections
a. Fluid mechanics and Biology – Life at low Reynold's number
b. Intermolecular interactions in chemistry
c. Thermodynamics of climate change

Course Content

Vectors and Kinematics
Newton's Laws of Motion
Forces, Impulse and Momentum
Work, Energy and Power
Rotational Kinematics and Dynamics
Centre of Mass
Moment of Inertia
Gravitational Field
Electric Field
Electric Circuits
Magnetic Field
Electromagnetism
Thermodynamics

Assessment (includes both continuous and summative assessment)

Component	Course LO Tested	Weighting	Team/Individual	Assessment rubrics
1. Final Examination	All	40%	Individual	Point-based marking (not rubric-based)
2. Homework	All	20%	Individual	Point-based, marking (not rubric-based)
3. Mid Term 1	LO 1 a,b,c	10%	Individual	Point-based marking (not rubric-based)
4. Mid Term 2	LO 2 a,b,c,d, e	10%	Individual	Point-based marking (not rubric-based)
5. In-class quizzes	LO 1,2,3,4	20%	Individual	Point-based marking (not rubric-based)
		100%		

Formative feedback

Formative feedback is given through discussion within tutorial lessons as well as interactive, computer based hints and pointers in the MasteringPhysics online homework and resource system.

Feedback is also given after each midterm on the common mistakes and level of difficulty of the problems.

Learning and Teaching approach

Approach	**How does this approach support students in achieving the learning outcomes?**
Tiered Problem solving (from conceptual to mathematical)	Develop competence in understanding physical concepts and solving physics problems
Hands-on group activities (during tutorial)	Develop physical intuition and competence in solving real-life problems. Relate everyday phenomena to physics.
Team-Based Learning during tutorials	Develop communication skills and competence in physics.

Reading and References

1. Physics for Scientists & Engineers with Modern Physics, 4th Edition, Douglas C. Giancoli, Pearson (2008).
2. University Physics with Modern Physics, 14th Edition, Hugh Young and Roger Freedman, Pearson (2015).

Course Policies and Student Responsibilities

Absence Due to Medical or Other Reasons

If you are sick and unable to attend your class, you have to:

1. Send an email to the instructor regarding the absence and request for a replacement class.
2. Submit the original Medical Certificate***** to administrator.
3. Attend the assigned replacement class (***subject to availability***).

***** The medical certificate mentioned above should be issued in Singapore by a medical practitioner registered with the Singapore Medical Association.

Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Course Instructors

Instructor	Office Location	Phone	Email
KOH Teck Seng	SPMS-PAP-03-08	6514 1066	kohteckseng@ntu.edu.sg

Planned Weekly Schedule

Week	Topic	Course LO	Readings/ Activities
1	Vectors and Kinematics	1a, 1b	All lectures are online and readings will be assigned after each video lecture is viewed.
2	Newton's Laws of Motion	1a, 1b	
3	Forces, Impulse and Momentum	1a, 1b	
4	Work, Energy and Power	1a, 1b	
5	Rotational Kinematics and Dynamics Midterm 1	1a, 1b	
6	Centre of Mass Moment of Inertia	1a, 1b	
7	Fluid Mechanics and special topic 5.a. Modelling in-class exercise	1c, 5a 4a, 4b	
8	Electric Field and special topic 5.b.	2a, 2b, 2c, 5b	
9	DC Circuits	2d, 2e	
10	Magnetic Field Midterm 2	2a, 2b, 2c	
11	Electromagnetic Induction	2a, 2b, 2c	
12	AC circuits	2d	
13	Thermodynamics and special topic 5.c.	3a, 3b, 5c	