

## ZCT 104 Modern Physics (Class A)

### General information

This is a Kursus Teras offered by school of physics only in semester II. The course ZCT 104 is split into two separate classes, i.e. ZCT 104 (Class A and Class B). The two classes are to be handled concurrently and independently by two different lecturers, namely Yoon Tiem Leong for ZCT 104 (Class A) and Dr. Ng Sha Shiong for ZCT 104 (Class B). The coursework assessment and final exam will be the same for both classes. In general, both classes will be using different sets of lecture notes and tutorial questions (though same overlap may be possible).

Generally ZCT 104 is taken by most first year students in the school of physics. This course serves the purpose to prepare the basic foundation for any science students (particularly physics students) who would need this very important basic mathematics in their future undertaking of any discipline of study. The course will be conducted in English. However, students can answer in either Bahasa or English in the final exam.

Since this is a 3 units course, as a rough guide, students have to spend about 3 hours for revision per week for this course. In other words, if you spend about 3 hours per week to practice the exercises it would be suffice to pass the course. Of course, if a student wants to score excellently he/she is required to walk an extra mile by spending more time than suggested for practicing the exercises

Lecturer for class A: [Yoon Tiem Leong](mailto:tlyoon@usm.my), School of Physics, USM, Room 115, Tel:04-6533674; e-mail: [tlyoon@usm.my](mailto:tlyoon@usm.my).

### Course Meeting Times

Lectures: Two lectures per week + 1 tutorial class per week

- 1) Monday, E 48A, 12.00-1.00 pm (lecture)
- 2) Wednesday, DKH, 9.00-9.50am (lecture)
- 3) Friday, SK1, 4.00-4.50 pm (tutorial) .

This course is intended to cover some of the standard concepts in modern physics since 1900. It includes special theory of relativity, wave-particle duality of light and material particles, introductory quantum theory of atoms and introductory quantum mechanics. The course aims to lay the foundational concepts for students who would take up papers on quantum mechanics at a higher level.

### Course Duration

This course is offered in the second semester for science students in USM -- a 14-week term at USM that runs from 17 Dec 2007 until end of March 2007.

### Course Prerequisites

Since ZCT 104 is conducted in English, students must prepare to take the challenge to deal with language barrier (if relevant). Despite requiring no formal prerequisites (prasyarat kursus), students are assumed to be familiar with elementary calculus, differential equations, and Newtonian mechanics. Most importantly, students are expected to exercise independence throughout the learning process. This course demands ones to think critically to comprehend some rather counter intuitive physics ideas.

## Consultation hours

There is no specific timeslots allocated for consultation with the lecturer as he of dedicated willingness to offer consultation and advice to students who wish to engage discussion with him. The principle of the lecturer is that: as long as the students are showing enthusiasm to learn, he will be willing to offer his time for discussion. However, in order to avoid inconvenience students are advised to call up (ext 3674) or email him ([tlyoon@usm.my](mailto:tlyoon@usm.my)) before rushing into his office. His door is always open to anyone who is keen to explore physics.

## Textbooks

The following textbooks are required or strongly recommended. There exist many good textbooks on the topics of modern physics. I have decided to select the following as my main reference texts. Lecture materials are written based on them. It is strongly advised that students should not be contented with the lecture material supplied by the lecturer alone. They should make reference to these suggested texts and do the reading on a consistent manner. You gonna prepare to think in an intellectual manner in order to comprehend the essential concepts I wish to convey in this course. To people who are expecting to make only mechanical memorisation and pass with flying colour, please be prepared for disappointment.

### Main Text:

1. Concepts of Modern Physics, 6th ed., by Arthur Beiser, McGraw-Hill.
2. Modern Physics, 2nd ed., by Kenneth Krane, John. Wiley & Sons.
3. Modern Physics, 3rd ed., by Serway, Moses and Moyer, Thomson 2005.
4. Understanding Physics, by Karen Cummings et. al., John Wiley and Sons, 2004 (used for special theory of relativity only).

### Others references:

#### Advanced texts for hard-core physics enthusiasts:

- Introduction to special relativity, by Robert Resnick, John Wiley & sons (readable and well explained, suggested for enthusiasts).
- Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles by Robert Eisberg, Robert Resnick, John Wiley & Sons; 2nd edition

#### Suggestion for the pleasure of understanding (not totally useful for exam but precious for intellectual pursuit)

- Relativity: The Special and the General Theory. Dover Publications (2001). A classic book by the creator himself, Einstein, for a clear explanation that everyone can understand. Minimum equations.
- The Feynman Lecture on Physics Volume III, by Richard Feynman, Addison Wesley Longman (June, 1970). (Read how Feynman expounds excellently on the basics of quantum mechanics.)

## Tutorial Classes

The 50 min time slot on Friday is reserved for tutorial discussion. During the tutorial session the class will still meet in the lecture hall and no separate 'tutorial classes' will be arranged. The lecturer in charged (Yoon) will conduct the tutorial class himself.

A total of 5 problem sets will be prepared for you. Problem sets are an integral part of this course. It simply isn't enough to learn physics unless you sit down and work through the problems and concepts on your own. Formally there will be some assigned tutors to provide guidance and counseling to the students on the subject. However, it is recognized that students also learn a great deal from talking to and working with each other. Therefore I encourage each student to make his/her own attempt on every problem. Discussion among yourselves shall definitely help a lot in understanding the course content more thoroughly. Our typical Malaysian students are used to spoon-feeding. As a matter of fact I am strongly disapproved of such unhealthy attitude. To encourage proactive and independent learning attitude (and to deprive your privilege to be a copy-cat and a bagger of spoon-

feedings), NO solution sheets shall be provided to you. We will only discuss the solutions on-the-spot during the tutorial meetings.

Please note the following: You shall pass up some selected tutorial answers to your tutor for grading each week (worth 5 marks). Deadline will be specified, and late submission will not be accepted. In order to promote discipline, rejection of late submission will be enforced strictly. Solutions and most updated coursework grades will be accessible in the ZCT 104 website.

### Assessment (Exam and coursework)

Grading will be weighted: Coursework will contribute 30 marks, while final exam 70 marks, totaling (30 + 70 = 100) marks. Please be noted that the coursework assessment and final exam will be the same for both classes.

### Coursework assessment (total 30 marks):

- (1) 2 common tests to be conducted on some selected Saturday mornings. These will be the common tests sat by both of the ZCT 104 A and B classes (10 + 10 = 20 marks).
- (2) Each week students shall submit some selected tutorial solutions for grading (5 marks).
- (3) Online assignment will be assigned once every week or so. This will be a descriptive type of assignment posed on the course webpage. Students have to submit a 300 words writing online before the deadline (5 marks).

### Final Exam (70 marks)

The final exam questions will appear in dual language: English + Malay. This will be a 3-hour exam covering almost everything from the lecture material will be conducted at the end of the semester. The format of the exam is yet to be finalized. Once it is been decided the format will be announced on the course webpage.

### Course Materials

Hard copy of lecture notes plus problem sets will be available for sale to students. If you like to view the simulation and colour pages not available in the hard copy version, [powerpoint lecture notes](#) are also downloadable on the ZCT 104 (Class A) webpage. Past year questions plus their solutions (tests, final exam and KSCP papers) and problem set are also available.

### Other Information

The performance of past year ZCT 104 classes (their exam and coursework grade distribution), as well as the lecturer's comment on these performances, can be accessed via internet. Check this out from the course webpages of the respective academic sessions via [www2.fizik.usm.my/tlyoon/teaching/](http://www2.fizik.usm.my/tlyoon/teaching/)