課程資訊 (Course Information)					
科號 Course Number	10720EE 211000	學分 Credit	3	人數限制 Size of Limit	50
中文名稱 Course Title	近代物理				
英文名稱 Course English Title	Modern Physics				
任課教師 Instructor	大江昌人				
上課時間 Time	M5M6R5	上課教室 Room	DELTA 台達 201		

課程大綱(Syllabus)

課程內容請依下列項目輸入：

1. Course Description(課程說明)

This course offers introduction to “Modern Physics” established in the 20th century. Knowledge on “Modern Physics” is fundamental to understand practically developed various optoelectronic contemporary devices such as transistors and lasers. The main purpose of this course is to learn fundamentals of relativity and quantum mechanics, which are representative fields beyond the concept of Newtonian mechanics. Relativity is the law for time and space and is usually concerned with high velocities comparable to the speed of light. Quantum mechanics is the law of the microscopic world for atoms, molecules and nuclei. Throughout this course, we mainly focus on learning how relativistic effects appear when dealing with high velocities, how ways of viewing materials have been developed and how materials are structured from microscopic viewpoints.

* The course is offered in English.

2. Text Books(指定用書)

“Concepts of Modern Physics”, sixth edition, by Arthur Beiser

3. References(參考書籍)

- Physics for Scientists and Engineers with Modern Physics, Serway, Raymond A, 2004
- Modern Physics, Randy Harris, Pearson Addison Wesley, 2008

4. Teaching Method(教學方式)

Combination of blackboard teaching with power point viewgraphs.

5. Syllabus(教學進度)

Session 0: Introduction – Course guide –

- What is “Modern Physics?” – Historical view

Session 1~3: Relativity

- Special relativity - Michelson-Morley experiment - Postulates of special relativity
- Time dilation - Length contraction - Lorentz transformation - Mass and energy
- Spacetime -Twin paradox - General relativity …etc.

Session 4~7: Problems with classical physics – Duality of photons and electrons –

- Blackbody radiation - Photoelectric effect - Compton scattering effect - What is light?
- Wave-function and density of probability - de Broglie matter wave - Uncertainty principle
- Particle in a box - Bohr theory and atomic spectra …etc.

Session 8: Atomic structure

- The nuclear atom - Electron orbits - Atomic spectra - Bohr atom
- Atomic spectra - Atomic excitation …etc.

Session 9: Midterm

Session 10~11: Introduction to quantum mechanics

- One dimensional Schrödinger equation and wave-function
- Simple model of square well potential box - Linearity and superposition - Harmonic oscillator
- -Operator -Expectation value - Tunneling phenomena …etc.

Session 12~13: Atomic and molecular physics

- Electron orbit - Atomic spectra - Rutherfords’s Nuclear Atom
- Three dimensional Schrodinger equation -Hydrogen atom - Quantum number - Spin
- Electron probability density - Periodic law of the elements - Exclusion principle
- Two atomic molecule -Hydrogen molecule - Bonding structures …etc.

Session 14: Statistical mechanics

- Maxwell-Boltzmann Distribution - Bose-Einstein Distribution - Fermi-Dirac Distribution …etc.

Session 15~16 The Solid state

- Bonding in solids - Free electron model - Electrons in periodic potential
- Band theory in solids - Semiconductor - Applications of semiconductor …etc.

Session 17: Final

**The contents will be adjusted during the course.

6. Evaluation(成績考核)

Midterm exam (30%), Final exam (30%), Homework and class attendance & participation (40%)

7. Webpage(可連結之網頁位址)

Lecture notes and other supplemental materials will be uploaded in iLMS.