Course syllabus

Basic Information:

Course title (中文): 有機光電材料科學

Course title (English): Materials Science for Organic Optoelectronics

Instructor: 大江昌人 (Oh-e, Masahito) (oh-e@ee.nthu.edu.tw) @台達館#838

Language for teaching: English

Class time: M5R5R6 *Location:* DELTA 台達 210

Course Description:

This course is constructively prepared for graduates as well as junior and senior undergraduate students. This course provides materials science required to understand optoelectronic device technology and does not deal with devices themselves. Before we explore the fundamentals of optoelectronic devices*, it is prerequisite for us to have fundamental knowledge on materials and their related areas, because optoelectronic devices are composed of interdisciplinary technologies. This course covers quantum chemistry from atoms to molecules, quantum mechanical frameworks for materials science, physics and chemistry of materials including photo-physical processes of molecules, light-matter interactions, molecule-molecule interactions and other materials related topics.

* These matters will be provided in "Organic Optoelectronics: Physics, Materials and Devices" (The course to be offered in the following spring (下) semester); however, the courses in the fall and spring semesters are basically independent.

** It is not required but desirable for students to master "Modern Physics" or other related courses.

*** The course is offered in English.

The class will begin on Sep. 15, Thursday.

Course materials:

Available on http://lms.nthu.edu.tw

References:

"Concepts of Modern Physics", sixth edition, by Arthur Beiser (Mc Graw Hill);

"Modern Quantum Mechanics", by J.J. Sakurai (Addison-Wesley Publishing Company);

"Organic Electro-Optics and Photonics: Molecules, Polymers and Crystals" by L. R. Dalton (Cambridge Univ. Press); "Optics and Nonlinear Optics of Liquid Crystals", by Iam-Choon Khoo (World Scientific);

"Nonlinear Optics", by Robert W. Boyd (Academic Press) ⋯, etc.

Teaching Method:

Combination of blackboard teaching with power point viewgraphs.

Report presentation by students.

Syllabus:

Session 0: Introduction – Course guide –

Session 1 – (4)5:

- ☐ Introduction to chemical bonding theory
- ☐ Quantized energy structures.
- ☐ From atoms to molecules (Computational chemistry).
- ☐ Quantization of molecular motion.

Session 5(6) – 7(8):

- ☐ Perturbation theory

Session (7)8 – 9:

- ☐ Symmetry of molecules

Session 9: Midterm

Session 10 – 11:

- ☐ Ligand field theory

Session 12 – 13:

- ☐ Photo-physics of molecules

Session (13) – 14:

- ☐ From single molecule to thin film

Session 15:

- ☐ Organic semiconductor
- ☐ Charge transport in organic thin film, …etc.

Session 16: Molecular orientation and its related topics

- ☐ Characterization of thin films
- ☐ Molecular orientation and optoelectronic devices
- ☐ Probing techniques
- ☐ Related optics and physics

Session 17: Final

**** The contents and plans will be appropriately changed and adjusted during the course.

***** Exams may be replaced with report works.

Grading:

Midterm exam (30%), Final exam including a report and presentation (40%), Homework and class attendance and participation (30%)

****** This may be adjusted in the end of the semester.