

課程資訊 (Course Information)					
科號 Course Number	10610IPT 599500	學分 Credit	3	人數限制 Size of Limit	30
中文名稱 Course Title	有機光電材料和元件				
英文名稱 Course English Title	Organic Optoelectronic Materials and Devices				
任課教師 Instructor	大江昌人				
上課時間 Time	M3M4R3	上課教室 Room	EECS 資電 208		

課程大綱(Syllabus)
<p>課程內容請依下列項目輸入：</p> <p>1. Course Description(課程說明)</p> <p>This course is newly offered constructively for graduate and senior undergraduate students. Organic optoelectronic devices such as LCD, OLED, OTFT, and OPVT are composed of interdisciplinary technologies. The technologies are formed by device physics, chemistry, materials science, optics, electronics, mechanical engineering and so on. Through introducing such organic optoelectronic devices, the course offers the details of the individual technologies combining with materials science and engineering from basics to applications, especially, we focus on display technologies with the indispensable basics of materials science. Half of the course focuses on materials science relevant to organic optoelectronic devices from the fundamental viewpoints, while the other half introduces some of applications and devices individually.</p> <p>* The course is offered in English.</p> <p>2. Text Books(指定用書)</p> <p>TBA</p> <p>3. References(參考書籍)</p> <p>“Concepts of Modern Physics”, sixth edition, by Arthur Beiser (Mc Graw Hill)</p> <p>“Organic electro-optics and photonics: molecules, polymers and crystals” by Larry R. Dalton (Cambridge Univ. Press);</p> <p>“Optics and nonlinear optics of liquid crystals”, by Iam-Choon Khoo (World Scientific).</p> <p>“Introduction to liquid crystals –Chemistry and Physics–”, by Peter J. Collings and Michael Hird (Taylor&amp;Francis)</p> <p>“Liquid crystal displays”, by Ernst Lueder (Wiley-SID series in display technologies)</p>

“OLED Displays and Lighting”, by Mitsuhiro Kodon (IEEE Press, John Wiley & Sons, 2017); ..., etc.

#### 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 –

Session 1~7: Materials science for organic optoelectronic devices

- From atoms to molecules.
- Quantized energy structures.
- Ligand field theory.
- Photo-physics of molecules
- Organic semiconductor
- From single molecule to thin film
- Charge transport in organic thin film, ...etc.

Session 8: Overview of liquid crystal display (LCD)

- Various Flat panel display (FPD), • Operating principles of LCD and driving schemes,
- Manufacturing process, • Peripheral technology supporting the liquid crystal industry, ... etc.

Session 9: Midterm

Session 10 -12: Fundamentals of LC

- What is LC? • Classification of LC, • Discovery of LC and history, • Why LC molecules tend to align?
- Order parameter and director, • Phase transition, • Frank's elastic free energy,
- Interaction with electric and magnetic field, • Frederik's transition,
- Optics of LC, • Topological defects of LC, • LC display modes, • In-plane switching LCD mode, ...etc.

Session 13-14: Overview of organic light-emitting diode (OLED)

- History of OLEDs, • Operation principles of OLED, • OLED device structures, • Fabrication process,
- Driving technologies of OLED display, • OLED Lighting, • Flexible OLEDs, • Other technologies, ...etc.

Session 15-16: Fundamentals of OLED

- Light emission mechanism, • Elementary processes, • Unit of light, • Efficiency, • Light extraction,
- OLED materials, • Energy transfer, • Marcus theory, ...etc.

Session 17: Final

\*\*\*The contents will be modified and adjusted during the course.

#### 6. Evaluation(成績考核)

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

#### 7. Webpage(可連結之網頁位址)

No webpage available, but lecture notes and other supplemental materials are uploaded in iLMS.

