

奈米物理導論 (I)(II) 2003-2004

instructors:

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講義置放地點: 物圖

參考書: 1. Introduction to Nanotechnology, C.P. Poole and F. J. Owen (Wiley Interscience 2003)

2. 奈米材料與奈米結構, 張立德、牟季美著 滄海書局

3. Low dimensional semiconductor structures,
edited by K. Barnham and D. Vvedensky (Cambridge University Press, 2001)

4. Nanotechnology edited by G. Timp (Springer, 1999)

成績: 50% homework 與平時成績 (簽到與課堂發問) + 50% 報告

報告內容與格式: 以課堂演講內容外, 額外找的資料與心得必須附上
reference

授課大綱 (I)

(1) Introduction to nanoscale science and technology (one week)

(2) Prerequisite physics background (5 weeks)

a. Elementary quantum mechanics

b. Elementary statistical physics

c. Essentials of solid state physics

(3) Synthesis and fabrication of nanomaterials and nanostructures (5 weeks)

a. MBE, CVD, lithography, pattern transfer, chemical methods, etc.

b. Growth mechanism and stability of nanomaterials

c. A survey of known nanomaterials and nanostructures:

nanocrystals, fullerenes, carbon nanotube, semiconductor

nanorods, nanocables, quantum wells, quantum dots, quantum wires,

2+1/2 and 1+1/2 superlattices, etc.

(4) Physics properties at nanoscales (5 weeks)

a. Effects of quantum confinement

-- optical and magnetic properties, tunneling phenomena, Coulomb blockade, etc.

- b. Physics of quantum transport at nanoscales
- c. Effects of temperature and morphology distribution

Total: 16 weeks

授課六編 (II)

- (5) Methods of measurements at nanoscales
 - a. Sensor principles
 - b. Scanning probes
 - c. Electron microscopy
 - d. Optical and electron spectroscopies
 - e. Calorimetric and mechanical measurements
- (6) Special topics in nanoscale science and technology
 - a. Nanoelectronics
 - b. Photonic crystals and nanophotonics
 - c. Nanoelectromechanical systems (NEMS)
 - d. Spintronics
 - e. Nanomagnetism
 - f. Quantum Computation
 - g. Biotechnology