Course Syllabus

ภาควิชา : วิศวกรรมไฟฟ้า **ชื่อวิชา** : Physical Electronics

Corequisite : 315 112 Fundamentals of Physics II

Textbooks : R. T. Howe and C. G. Sodini,*"Microelectronic : An Integrated Approach"*, Prentice-Hall, 1997.

Recommendation Reading :

1. C. G. Fonstad *"Microelectronic Devices and Circuits"*, McGraw-Hill, 1994.
2. G. Parker, *"Introductory Semiconductor Device Physics"*, Prentice Hall, 1994.
3. M. S. Tyagi, *"Introduction to Semiconductor Materials and Devices"*, John Wiley & Sons Inc, 1991.
4. J. Singh, *"Semiconductor Devices: An Introduction"*, McGraw-Hill International Editions, 1994.
5. R. M. Warner, Jr. and B. L. Grung, *"Semiconductor Devices-Electronics"*, HRW Saunders International Editions, 1991.
6. B. G. Streetman, *"Solid State Electronic Devices"*, Prentice Hall, 1990.
7. D. A. Neamen, *"Semiconductor Physics and Devices : Basic Principles"*, Irwin Inc, 1992.
8. R. S. Muller and T. I. Kamins, *"Device Electronics for Integrated Circuits"*, 2nd Edition, John Wiley & Sons Inc, 1986.
9. R. F. Pierret, *"Semiconductor Device Fundamentals"*, Addison-Wesley Publishing Company, 1996.
10. IEEE Journal on Solid-State Circuits (SC), IEEE Transaction on Electron Devices (ED), and IEEE Electron Devices Letter (EDL).

Objective :

1. To give introductory concepts of the underlying physics of semiconductor devices.
2. To provide a basis for understanding the characteristics, operation, and limitations of semiconductor devices.

Examination :

1. Midterm Test	40 %
2. Final Test	50 %
3. Attention and Assignment	10 %

Language of Lecture : Thai

Language of Examination : English

Course Description :

ทฤษฎีพื้นฐานเกี่ยวกับโซลิดสเตท สารกึ่งตัวนำ เทคโนโลยีในการสร้างสารกึ่งตัวนำ การโด๊ปสาร รอยต่อพี-เอ็น รอยต่อสารกึ่งตัวนำกับโลหะ ไบโพลาร์และเฟททรานซิสเตอร์ วงจรรวม อุปกรณ์อีเล็กทรอนิกส์ที่เกี่ยวกับแสง และอุปกรณ์อีเล็กทรอนิกส์ที่ใช้กำลังสูง

Basic theory of solid-state, Semiconductors, Fabrication technologies, Doping, P-N Junction, Semiconductor-Metal junction, Bipolar and FET transistors, Integrated circuits, Optical and power semiconductor devices.

Chapter	Topics	Hours
2	**Introduction** • Introduction to Physical Electronics • Semiconductor Physics	**2** 1 1
3	**PN Junction and MOS Electrostatics** • Applied Electrostatics • Carrier Concentration and Potential in Thermal Equilibrium • The PN Junction • Depletion Capacitance • The MOS Capacitor • The Electrostatics of the MOS Capacitor • Capacitance of the MOS Structure	**10** 2 1 2 1 2 1 1
4	**The MOS Field Effect Transistor** • Device Physics of the MOSFET • MOSFET Circuit Models	**6** 3 3
6	**The PN Junction Diode** • PN Junction Diode Circuit Models • SPICE Model of the PN Junction Diode • Minority Carrier Distributions and Current Components	**6** 3 1 2
7	**The Bipolar Junction Transistor** • Physics of Bipolar Junction Transistor • The Ebers-Moll Equations • Small Signal Model of the Bipolar Junction Transistor • Lateral pnp Bipolar Transistor	**6** 2 1 2 1
	Total	**30**