

Lectures in Electronic Devices

(3rd Year, Course 1)

Assistant Professor Dr. Hamad Rahman Jappor

Department of Physics

University of Babylon

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محاضرات في الالكترونيات (النبائط الالكترونية)

(المرحلة الثالثة، الكورس الاول)

اعداد

الأستاذ مساعد الدكتور حمد رحمن جبر

قسم الفيزياء

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Contents

Chapter 1: Semiconductor Material

The atom, materials used in electronics, current in semiconductors, N-type and P-type semiconductors, PN junction, Energy Diagrams of *PN* Junction.

Chapter 2: Diodes and applications

Diode operation, voltage-current characteristics, diode models, half-wave rectifiers, full-wave rectifiers, diode limiters and clampers, voltage multipliers.

Chapter 3: Special-Purpose Diodes

Zener diodes, Zener diode applications, Varactor diodes, optical diodes.

Chapter 4: Bipolar Junction Transistors (BJTs)

Bipolar junction transistor (BJT) structure, basic BJT operation, BJT characteristics and parameters, the BJT as an amplifier, the BJT as a switch, The DC operating point, voltage-divider bias, other bias methods.

Chapter 5: BJT Amplifiers

Amplifier operation, linear amplifier, transistor ac models, the common-emitter amplifier, the common-collector amplifier, the common-base amplifier, transistors as a small signal amplifier, gain.

Chapter 6: Field-effect transistors (FETs)

The JFET, JFET characteristics and parameters, JFET biasing, the MOSFET, MOSFET characteristics and parameters, MOSFET biasing.

Chapter 7: FET Amplifiers

FET amplification, common-source amplifiers, common-drain amplifiers common-gate amplifiers, the class D amplifier, MOSFET analog switching.

Chapter 8: Amplifier Frequency Response

Effect of coupling capacitors, miller's theorem, the decibel, low-frequency amplifier response, high-frequency amplifier response, total amplifier frequency response.

Chapter 9: Thyristors

The four-layer diode, the silicon-controlled rectifier (SCR), SCR applications, the diac and triac, the silicon-controlled switch, the unijunction transistor, the programmable unijunction transistor.

Chapter 10: The Operational Amplifier

Introduction to operational amplifiers, op-amp input modes and parameters negative feedback, op-amps with negative feedback, effects of negative feedback on op-amp impedances, bias current and offset voltage, compensation, open-loop response.

Chapter 11: Basic Op-Amp Circuits

Comparators, summing amplifiers, integrators, differentiators, instrumentation amplifiers, isolation amplifiers, operational transconductance amplifiers, log and antilog amplifiers, converters and other op-amp circuits.

Chapter 12: Active Filters

Basic filter responses, filter response characteristics, active low-pass filters, active high-pass, filters active, band-pass filters, active band-stop filters, filter response measurements.

Chapter 13: Oscillator

The oscillator, feedback oscillator, positive feedback, conditions of oscillation, the Wien-Bridge oscillator, relaxation oscillators, noise, thermal noise, shot noise, flicker noise, burst noise, avalanche noise

Chapter 14: Voltage Regulators:

Voltage regulation, basic linear series regulator, basic linear shunt regulators, basic switching regulator, integrated circuit voltage regulators integrated circuit voltage regulator.

Textbook:

- 1- Thomas L. Floyd, Electronic Devices: Electron Flow Version, 9th edition Pearson Education Inc., Upper Saddle River, New Jersey, 2012.

References:

- 1- R. Boylestad., and L. Nashelsky, Electronic Devices and Circuit Theory. 10th edition, Pearson Education International, 2008.
- 2- Horowitz and Hill, The Art of Electronics, 2nd edition, Cambridge University Press, 1989.
- 3- A. Malvino, and D. J. Bates, Electronic principle, McGraw Hill, 7th edition, 2005.