

BENT211 Electrical and Electronic Components 1

ECTS Value: 5 ECTS
Self-Study Hours: 64

Contact Hours: 25
Assessment Hours: 36

Overall Objectives and Outcomes

This module starts by giving the student a basic understanding of discrete electronic components such as diodes, and transistors. It will then continue by outlining how the discrete devices may be integrated together to form integrated circuits such as logic gates, the 555 timer and voltage regulators. The module will finally conclude by looking at other ancillary components (PCB connectors, battery holders, sockets and IC holders) used in the construction of electronic circuits.

By the end of this module, the learner will be able to:

Competences

- a. combine n-type and p-type semiconductor materials to form junctions;
- b. design simple circuits using Bipolar Junction Transistors (BJT) with an understanding of the underlying physics;
- c. use Operational Amplifiers for basic electronic circuits;
- d. apply the 555 timer in the design of electronic circuits;
- e. compile truth tables of logic gates such as the AND, OR, and NOT gates;
- f. critically select the best of voltage regulators suitable for particular tasks;
- g. determine the ideal IC package types which are available for particular projects.

Knowledge

- a. communicate understanding of what a silicon-based semiconductor is;
- b. understand the processes which occur in the junction and how such junction forms the basis of operation of a Diode;
- c. know how a junction diode can be forward or reverse biased;
- d. understand the principles of operation of an LED (Light Emitting Diode);
- e. understand the limitations of the bipolar junction transistor which indicate the FET as a suitable candidate;
- f. outline the principles of the BJT and how a transistor operates and how it can act as a switch;
- g. know the characteristics and operation of two FET (Field Effect Transistor) types including the JFET (junction field effect transistor) and MOSFET (metal oxide semiconductor field-effect transistor);
- h. have an understanding of how discrete transistors can be integrated onto a silicon chip to build an IC (integrated circuit);
- i. describe the basic Operational amplifier and its characteristics.

Skills

- a. use a diode as a simple rectifier;
- b. select circuit components including transistors required to build amplifiers;
- c. use the 555 timer in simple electronic circuits;
- d. interpret data sheets for particular devices and ICs to determine expected functionality.

Assessment Methods

This module will be assessed through: Research Assignment (50%), Presentation (20%), Practical assignment (30%).

Suggested Readings

Core Reading List:

1. Boylestad Robert, Nashelsky Louis, (2013). Electronic Devices and Circuit Theory. Pearson Education.
2. Coombs, Jr. Clyde F., (2007). Printed Circuit Handbook Sixth Edition. McGraw Hill Professional.
3. Floyd Thomas L., (2017). Electronic Devices. Pearson.
4. Harowitz Paul, Hill Winfield, (2015). The Art of Electronics. Cambridge University Press.
5. Hughes Edward, (2008). Hughes Electrical and Electronic Technology, Tenth Edition. Pearson PH.
6. M Kaplan Daniel, G White Christopher, (2003). Hands on Electronics: A one semester course for class instruction or self-study. Cambridge University Press.

Supplementary Reading List:

1. M Kaplan Daniel, G White Christopher, (2003). Hands on Electronics: A one semester course for class instruction or self-study. Cambridge University Press.
2. Floyd Thomas L., (2017). Electronic Devices. Pearson.