

Jimma University
College of natural Sciences
Department of Physics

Course outline: Electronics I

Course Title : Electronics I
Course Code: Phys2062 Credits Hours: 3

Instructor: Mrs. Hiwot Tegegn, Lecturer

Course Rationale

This course is intended to provide basic concepts and practices of electronics. It is structured in such a way that the learner has to go through the activities as prescribed for maximum attainment. This course helps to appreciate and apply basic electronic concepts and circuits in instrumentation and research.

Chapter One: Network theories and equivalent circuits

- Kirchhoffs rules
- Mesh analysis
- Nortons theorem
- Thevenins Equivalent circuits
- Conversion of Thevenins to Nortons equivalent circuits
- Delta and Y Network

Chapter Two: The physics of semiconductors

- Formation of energy bands
- Metals, insulators and semiconductors
- Intrinsic and extrinsic semiconductors,
- P type and N type extrinsic semiconductors
- Carrier mobility, drift velocity and drift current density
- The PN junction
- V-I characteristics of a PN junction diode
- Ideal diode equation
- PN junction breakdowns
- Diode circuit analysis
- Diode as a rectifier
- Half wave and Fullwave rectifier
- How effectively a rectifier converts AC in to DC
- Types of diodes

Chapter Three: Bipolar junction transistors (BJT)

- PNP and NPN transistors
- the surprising action of a transistor
- the working of a transistor
- Transistor amplifying action
- Transistor configurations
- Biasing the BJT for discrete circuit design
- Biasing single stage BJT amplifier (Common emitter, base and collector configuration)
- Transistor Operation
- Transistor Parameter
- Analysis of transistor circuits at DC

Chapter Four: Field Effect Transistors

- The junction field effect transistor (JFET), JFET Common Source Amplifier, JFET
- Common Drain amplifier
- Insulated-Gate Field Effect Transistor. Power,
- Multiple Transistor Circuit

Chapter Five: Operational Amplifiers and Oscillations

- Open loop Amplifiers,
- Ideal Amplifiers, Approximation Analysis Ope-loop Gain.
- The Ideal Op-Amp
- Analysis of Circuit Containing Ideal Op-Amps- Inverting Configuration
- Applications of the Inverting Configurations
- The Noninverting Configuration
- Examples of Op-Amp Circuits
- Transister amplifier, biasing points

Chapter Six: Digital Circuits

- Number systems, Boolean Algebra, Logic Gates,
- Combinational Logic,
- Multiplexes and decoders, Schmitt Trigger, Two-State storage elements
- Latches and unclocked flip-flops;
- Dynamically clocked flipiflops,
- One-shot registers
- Digital information in series, parallel or timed signals

Chapter Seven: Data Acquisition and Process Control

- Transducers, Signal conditioning
- Circuits, Oscillators
- Radio basics AM Receivers and RF Spectrum

Course Textbook

Bernard Grob, Basic Electronics, 4th ed., McGraw Hill International Book Company, London, (1983).

References

1. Frederick F. Driscoll; Robert F. Coughlin. Solid State devices and Applications, D.B Taraporevala Sons and Co.PVT, Published with arrangement with Prentice Hall, Inc. (1981).
2. Close K.J and J Yarwood. Experimental Electronics for Students, London Chapman and Hall, Halsted Press Book, John Woley and Sons, (1979).
3. Tayal D.C. Basic Electronics. 2nd ed. Himalaya Publishing House Mumbai, (1998).
4. Theraja B.L., R.S. Sedha. Principles of Electronic Devices and Circuits, S.Chand and Company Ltd, New Delhi, (2004).