TECHNICAL UNIVERSITY OF MOMBASA

JANUARY – APRIL 2022

BTIT/SEP2020/J-FT

BTIT/JAN2021/J-FT

TIME – MONDAY 7.00 AM -10.00 AM

BSCS/SEP2020/J-FT

BSCS/JAN2021/J-FT

TIME – MONDAY 10.00 AM -1.00 PM

BSIT/SEP2020/J-FT

BSIT/JAN2021/J-FT

TIME – TUESDAY 10.00 AM -1.00 PM

CCI 4202 Electronics

Lecturer ; Mutuku K Ngao

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CCI 4202 **Electronics**

Contact Hours: 45 hours

Prerequisites: **APS 4101, APS 4102 PHYSICS**

Purpose: To develop knowledge on the construction of electronic devices and practical skills on how they operate.

Expected Learning Outcomes

At the end of this unit of study, the student should be able to:

(i.) Explain the importance of electronics in Information technology.

(ii.) Describe the characteristics of various electronic components used in information technology.

(iii.) Analysis and design electronic components.

Course Description

Semiconductor Diodes: P-N junction Diode, Resistance levels, Diode Equivalent circuits, Zener diodes, Load line Analysis, Series diode configurations with D.C Inputs, Half-Wave rectification, Full-Wave rectification, Clippers and Clampers. Bipolar Junction. Transistors. Analysis of transistor amplifier using h-parameters. Unipolar Devices: Construction and characteristics of JFETs. Depletion type MOSFETs, Enhancement type MOSFETs, Fixed bias configuration, Self-bias configuration, FET small signal model. Source Follower Circuit, Common Gate circuit, Uni junction. Transistor. Optical Devices: Light Emitting Diodes, Liquid Crystal Display, Photo Diodes, Photo Conductive Cells, Solar Cells, Principles of Cathode Ray Tube. Electronic devices: Resistors, *Ohms law. Networked Circuits: (Kirchoffs, Thevenin, Nortons laws).* Capacitors (electrolytic, foil) use, charging and discharging. Diodes (P-N junction, LED, Zener, Photodiodes) characteristics and applications. Transistors (BJT, MOSFET) biasing and applications. Thyristors and triacs(SCR) block diagram and basic operations of Operational Amplifier. Thermistors: positive and negative coefficient.

CCI 4202 ELECTRONICS

Electronics is generally divided into two units.

1. Analogue Electronics
2. Digital Electronics

With the advancement of Digital Electronics one would ask, why learn Analogue Electronics.

The world we live in is analog. For example, sounds are analog signals; they are continuous time and continuous value. Our ears listen to analog signals and we speak with analog signals. Images, pictures, and video are all analog at the source and our eyes are analog sensors. Measuring our heartbeat, tracking our activity, all requires processing analog sensor information.

Electronics plays a major role in our daily life for example in:

Consumer electronics

- They include Calculators, scanners, Radios, TV, Computers, Printers, Fax machines etc.
- Refrigerators, washing Machines, Ovens vacuum cleaners are part of the electronic home appliances.
- Audio, Video Systems, Video Cassette Recorder VCR, Video Game Consoles are electronic devices too.
- ATM, Smart Phones, Dish Washers, PDA, Bar Code Scanners are also electronic devices.
- Storage devices such as memory cards, DVD Players, MP3 Players.
- Transport industry with self- driven cars.

Medical Applications for physiological Analysis and diagnose of diseases.

Industrial Applications to increase productivity and efficiency –human automation.

Industrial Automation, Motion Control, Machine Learning, Robotics, etc

Image Processing in 3D and 2D

Daily use devices:

1. Smartphones, tablets, Ipods
2. Wi-fi and Internet
3. Digital Sounds/Music
4. Digital Camera
5. Food industry

This course will have five modules that correspond to the material in the textbooks and

WEEK	CONTENT
1-3	Electronic devices: Resistors, *Ohms law. Networked Circuits: (Kirchoffs, Thevenin, Nortons laws).* *assignment 1*
4-5	Capacitors (electrolytic, foil) use, charging and discharging. Applications of Capacitors. Inductors: Types, Applications. CA
6-7	Semiconductor Diodes: P-N junction Diode, Resistance levels, Diode Equivalent circuits, Zener diodes, Load line Analysis, Series diode configurations with D.C Inputs, Half-Wave rectification, Full-Wave rectification, Clippers and Clampers. Diodes (P-N junction, LED, Zener, Photodiodes) characteristics and applications Optical Devices: Light Emitting Diodes, Liquid Crystal Display, Photo Diodes, Photo Conductive Cells, Solar Cells, Principles of Cathode Ray Tube
8-10	Bipolar Junction Transistors. Transistors (BJT, MOSFET) biasing and applications. Analysis of transistor amplifier using h- parameters. Unipolar Devices: Construction and characteristics of JFETs. Depletion type MOSFETs, Enhancement type MOSFETs, Fixed bias configuration, Self-bias configuration, FET small signal model. Source Follower Circuit, Common Gate circuit, Uni junction Assignment 2/CA 2
11-12	Thyristors and triacs(SCR) block diagram and basic operations of Operational Amplifier. Thermistors: positive and negative coefficient.

course readings.

Teaching Methodology

Lectures, tutorials, practical.

Instructional Materials /Equipment

A computer infrastructure laboratory, laboratory manuals, digital electronics fundamental components like gates, diodes, transistors; overhead presentation equipment.

Assessment

Type	Weighting (%)
Examination	70%
Continuous Assessment	30%
Total	100%

Recommended Texts and Journals

1. Tokheim, R.L. (2007). *Digital Electronics: Principles and Applications* (3rd ed.). Boston: McGraw Hill Higher Education.
2. Jain, R.P. (2006). *Modern Digital Electronics*. Boston: McGraw Hill Higher Education.
3. Reid, K. and Dueck, R. (2008). *Introduction to Digital Electronics* (1st ed.). Boston, M.A.: Thomson Course Technology.
4. Bignell, J. (2007). Digital Electronics, 5th Edition. Boston, M.A.: Thomson Course Technology.
5. *International Journal of Electronics and Communications*.
6. *Journal of Systems Engineering and Electronics*.

Reference Texts and Journals for further reading

1. Floyd, T.L. (2008). *Digital Fundamentals* (10th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.
2. Kleitz, W. (2007). *Digital Electronics: A Practical Approach* (8th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.
3. *IEEE Computer Society*. http://www.computer.org/

REFERENCES AVAILABLE IN THE TUM LIBRARY

(HALL A, (E TK) ELECTRICAL, ELECTRONICS AND NUCLEAR ENGINEERING)

1. Thomas L. Floyd, David L. Bucha (2014). Electronics Fundamentals: Circuits, Devices and Applications.
2. Mitchel E. Schultz (2007). Grobs's Basic Electronics, Fourth Edition, 10th Editions
3. Tom Duncan (1997). Electronics for Today and Tomorrow 2ND Edition.
4. Anart Agarwal and Jeffry H. Lang (2005). Fundamentals of Analog and Digital Electronics Circuits.
5. Richard C. Jaeger, Travis N Blalock (2011). Microelectronics Circuit Design.
6. Robert L. Boylestad, Louis Nashelsky (2006). Electronic Devices and Circuit Theory.
7. Mike Tooley (2013). Electronic Circuits: Fundamentals and Applications.
8. Brayan Hart (1997). Introduction to Analogue Electronics.
9. Daniel M. Kaplan, Christopher G. White. Hands – on Electronics: A Practical Introduction to Analogue and Digital Circuits.