

Government Degree College, Baramulla (Autonomous)

SEMESTER 2nd

MAJOR/MINOR COURSE

Subject: Electronics

Course Title: Electronics: Linear and Digital Integrated Circuits (Electronics-II)

Course Code: BET22C201

Credit: (4+2) Theory: 04; Practical: 02

Contact Hours: 64 (T) + 64 L)

Part 1: Theory (4 Credits)

Course Objectives:

- *To understand the basics of operational amplifiers and different applications of operational amplifiers.*
- *To be able to understand the number systems and logic gates with their arithmetic applications.*
- *The student should be able to understand the combinational logic analysis and design with sequential circuits.*

Learning outcomes:

On completion of the course, the student should be able to:

- 1. To design the operational amplifiers for different applications.*
- 2. Design the logic gates.*
- 3. Simulations for electronic circuits and devices using software.*

Unit-I: Linear Integrated Circuits and its Applications (16 Contact hours)

Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Open and closed loop configuration, Frequency Response. CMRR. Slew Rate and concept of Virtual Ground. Inverting and non-inverting amplifiers, Summing and Difference Amplifier, Differentiator, Integrator, Wein bridge oscillator, Comparator and Zero-crossing detector, and Active low pass and high pass Butterworth filter (1st and second order only).

Unit-II: Number System and logic Gates (16 Contact hours)

Decimal, Binary, Octal and Hexadecimal number systems, base conversions. Representation of signed and unsigned numbers, BCD code. Binary addition, subtraction by 2's complement method, octal addition, subtraction and hexadecimal arithmetic addition. Logic Gates and Boolean algebra: Truth Tables of OR, AND, NOT, NOR, NAND, XOR, XNOR, Universal Gates, Basic postulates and fundamental theorems of Boolean algebra.

Unit-III: Combinational Logic Analysis and Design (16 Contact hours)

Standard representation of logic functions (SOP and POS), Minimization Techniques (Karnaugh map minimization up to 4 variables for SOP). Arithmetic Circuits: Binary Addition. Half and Full Adder. Half and Full Subtractor, 4-bit binary Adder/ Subtractor. Multiplexers, De-multiplexers, Decoders, Encoders.

(15 Lectures)

Government Degree College, Baramulla (Autonomous)

Unit-IV: Sequential Circuits

(16 Contact hours)

Introduction to 555 timer, SR – Flip Flop, D – Flip Flop, and JK – Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race-around conditions in JK Flip-Flop. Master-slave JK Flip-Flop. Shift registers: Serial-inSerial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits).

Suggested Books

1. **Digital Principles and Applications**, A.P. Malvino, D.P. Leach and Saha, 7th Ed., 2011, Tata McGraw Hill.
2. **OP-Amps and Linear Integrated Circuit**, R. A. Gayakwad, 4th edn., 2000, Prentice Hall
3. R.L. Tokheim, **Digital Principles**, Schaum's Outline Series, Tata McGraw-Hill (1994)
4. **Digital Electronics**, S.K. Mandal, 2010, 1st edition, McGraw Hill.

Lab: Op-Amps and Logic Circuits (Hardware and Simulations)

1. To design an inverting amplifier using Op-amp (741,351) for dc voltage of given gain.
2. (a) To design inverting amplifier using Op-amp (741,351) & study its frequency response.
(b) To design non-inverting amplifier using Op-amp (741,351) & study frequency response.
3. (a) To add two dc voltages using Op-amp in inverting and non-inverting mode.
(b) To study the zero-crossing detector and comparator.
4. To design a precision Differential amplifier of given I/O specification using Op-amp.
5. To investigate the use of an op-amp as an Integrator.
6. To investigate the use of an op-amp as a Differentiator.
7. To design a different logic system for a specified Truth Table.

Government Degree College, Baramulla

SEMESTER 2nd

SKILL ENHANCEMENT COURSES

Subject: Electronics

Title: Repair and Maintenance of Electronic Appliances (Repair and Maintenance of Power Supplies, Inverters and Ups)

Course Code: BET22S202:

CREDITS: 04 (THEORY – 02; PRACTICAL - 02)

COURSE OBJECTIVES:

To provide an understanding of working principles of stabilizers, CVTs, Inverters and UPS and their repair.

LEARNING OUTCOMES:

After studying this course, the students shall be able to:

- *Understand working principles of various stabilizers, CVTs, inverters and UPS.*
- *Understand various types of transformers and power backup equipment.*
- *Service and repair various types of faults in transformers and power backup equipment.*

Unit I: Stabilizer and CVT:

Need of stabilizer, working principle, types of stabilizer, Auto-cut and automatic stabilizer, Servo Stabilizer, Study of Control Circuit of Stabilizer, Transformer employed in stabilizer, Multiwinding/Multitaped transformer, Introduction to Constant Voltage transformer, General Circuit diagram of CVT, working principle of CVT, EMI/RFI filter, Surge Suppressor, Repairing of CVT.

Unit II: Inverters and UPS:

Introduction to inverters, Types of inverters, Pulse width modulated Inverter, Voltage cancellation in inverters, Single Phase Voltage source inverters, Single Phase Bridge Inverters, 3 Phase inverters.

Introduction to UPS, Types of UPS, Offline UPS, Online UPS, Line Interactive UPS, Input components in UPS, Trap Filter in UPS, UPS Rectifier stage IGBT Type, DC system components in Online UPS, Digital Power Quality Envelope.

Books Suggested:

1. Power electronics: converters, applications, and design by Ned Mohan.

Government Degree College, Baramulla

2. Fundamentals of Power Electronics by Robeert W Eriction.
3. Power Electronics: Circuits, Devices, and Applications by M.H. Rashid.
4. Introduction to Power Electronics by Daniel W Hart

Laboratory:

To study the operation of transformers

To study the construction of stabilizer.

To study the transformer employed in stabilizer.

To study the characteristics and repairing of CVT

To study the characteristics of Inverter.

To study different range and types of oscillators.

To study the construction of Inverter.

To study different types of source generators. To verify Superposition theorem.

Troubleshooting of UPS

Government degree College, Baramulla (Autonomous)

Semester 1st – 3rd

Multidisciplinary Course

Subject: Electronics

Course Title: Introduction to Electronics

Code: BET22M202

Credit: (03)

48 teaching hours

Course Objectives:

- ✓ To learn core components, Devices, process and functionalities of Electronics.
- ✓ To understand the basic measuring equipment's required to perform electronic experiments.
- ✓ To understand the importance of Electronics in day-to-day life.
- ✓ To understand the role of Electronics in consumer, medical, industry products etc.

Learning outcomes:

After studying the course, the student shall be motivated to pursue the course for higher education. The course will also help the student to select the future area of work. Further, the student will be able to have a comprehensive understanding of electronic devices and circuits and their application in various fields.

Unit I: Fundamentals of Electronics

What is Electronics and why to study it?; The Historical Evolution of Electronics and its Impact on Society & Innovation; Electric current & Voltage; Introduction to Basic Components of Electronics and their applications (Resistor, Capacitor, Inductor); Introduction to Semiconductor Devices and their applications (Diode, Transistor); Introduction to Integrated Circuits (ICs); Introduction to Electronic Equipment (Oscilloscope, Function Generator, Power Supply, Multimeter); Discovering Electronics around us.

Unit II: Electronics in Contemporary World

Electronics for Signal conversion and Control: Rectification (Mobile charger); Amplification (Microphone and Loud Speaker); and Control (Inverters); Introduction to consumer Electronics & Electronic Home appliances: Radio, TV, Personal computer, Printer, Washing machine, Microwave ovens (A qualitative treatment only); Electronics in ICT: Introduction to Telephony, Telecom network spectrum, Mobile phones and Satellite communication.

Unit III: Electronics in Smart World

Evolution of smart homes; Video monitoring, Security and alarms, CCTV; Role of Electronics in Education and Agriculture (Drones for disease detection and survey, Smart-irrigation); Electronics in Automation; Electronics in Healthcare: Digital Thermometers, BP measurement, Digital X-Ray, MRI, USG, ECG (Basic principle only).

Recommended Books:

Government degree College, Baramulla (Autonomous)

1. Bernard Grob, **Basic Electronics**, Mc Graw-Hill Book Company
2. Ian R. Sinclair and John Dunton, **Practical electronics handbook**, 6th Edition, Elsevier.
3. Mike Tooley, **Electronic circuits: fundamentals and applications**, 5th Edition, Taylor & Francis.
4. D. Chattopadhyay and P. C. Rakshit, **Basic electronics**, New age international (P) limited.
5. Theodore F. Bogart, **Electric Circuits**, 2nd Edition, McGraw Hill Education.
6. Boylested, R. L. and Nashelsky, L., **Electronic Devices and Circuit Theory**, Pearson Education
7. Stan Gibilisco, **Teach Yourself Electricity and Electronics**, McGraw-Hill
8. Edward L. Wolf, **Quantum Nanoelectronics**, Second Edition, Wiley
9. **Getting Started in Electronics** by Forrest M. Mims
10. **Electronics for Dummies** by Shamieh Cathleen, Wiley, 2019
11. **Consumer Electronics** by S P Bali, Pearson, 2008
12. **Handbook of Biomedical Instrumentation**, R S Khandpur, Tata Mc Graw Hill, 2014
13. **Emerging Trends in Electronics** Vijay G. Yangalwar Nirali Prakahshan Publishers, 2020
14. **Paul Horowitz The Art of Electronics** Cambridge University Press; 1st edition, 2020