Govt. Degree College Baramulla (Autonomous)

SYLLABUS (FYUP UNDER NEP2020)

Offered By Department ofElectronics

Semester3rd (Major/Minor Course)

Course Title: Operational Amplifier and Linear Integrated Circuits

Course Code: ELT322M
Credits: 6 (Theory:
Contact Hrs: 120 (Theory: 60, Practical: 60)

Max. Marks 150
Theory External: 100; Min Marks: 40
Practical Experimental Basis= 50, Min. Marks: 20

Objectives

- *To learn the fundamentals of Operational Amplifiers.*
- *To learnvariousOperational Amplifier Parameters*
- *To understanddifferent types of negative feedback*
- *To learn the use of Op-Amps for wide range of applications*
- *To learn above the various other Linear Integrated Circuits and their applications*

Learning Outcomes

By the end of this course, the students will be able:

- *Understand functioning of Operational Amplifiers*
- *Design operational amplifier circuits*
- *Design Oscillators and active filters using op-amps*
- *Explain the working and applications of timer, VCO and PLL ICs*
- *Outline the working of Three-terminal Voltage regulator ICs*

UNIT 1: 15 Hrs

Operational Amplifiers: Basic differential Amplifier, Block Diagram of Op-Amp (IC 741). Characteristics of an Ideal and Practical Operational Amplifier. Open and Closed Loop configuration. Concept of Virtual Ground. Op-Amp Parameters: Input Offset Voltage, Input Offset Current, Input Bias Current. Common Mode Rejection Ratio (CMRR). Slew Rate. Power Supply Rejection Ratio (PSRR).

UNIT 2: 15 Hrs

Op-amp with negative feedback: General concept of Voltage Series, Voltage Shunt, CurrentSeries and Current Shunt Negative Feedback. Op Amp circuits with Voltage Series and Voltage ShuntFeedback.
Applications of Op-Amps: Inverting and Non-inverting Amplifiers, Summing and Difference Amplifier, Instrumentation Amplifier, Differentiator and Integrator, Comparator and Schmitt Trigger.

UNIT 3: 15 Hrs

Data Converters: Analog-to-Digital (Flash and Successive Approximation type). Digital-to-Analog Converters (Weighted Resistor and R-2R Ladder type).
Active Filters using Op-Amps: First and Second Order Active Low Pass, high Pass,Band PassandBand Stop Butterworth Filters.
Oscillators and Signal Generators: Barkhausen criterion for Sustained Oscillations, Phase Shift Oscillator, Wien-bridge oscillator, Square Wave Generator, Triangle Wave Generators.

UNIT 4: 15Hrs

IC 555 Timer: Introduction, Block diagram, Astable and Monostable multivibrator circuits.
Phase Locked Loops (PLL): Block Diagram and Characteristics, IC565 PLL, Phase Detectors, Voltage Controlled Oscillator (IC 566).Overview of PLL Applications.

(Dr. M. Rafiq Beigh)
GDC Sumbal

11/2/23
Dr. Imtiyaz A. Shah
University of Kashmir

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Voltage Regulators: Basic circuit configuration and characteristics, Basic blocks of linear voltage regulator, three terminal fixed regulators (78XX and 79XX), Concept of Adjustable and Switching Regulators.

UNIT: Practical/Lab Course, Credits=2) **60 Hrs**

At least 08 experiments from the following list:
(Hardware and Circuit Simulation)

1. Study Op-Amp Characteristics: CMRR and Slew Rate.
2. Design Inverting and Non-Inverting Amplifier of given Gain using Op-Amp.
3. Design Analog Adder and Subtractor Circuit using Op-Amp.
4. Design Integrator and Differentiator using Op-Amp.
5. Design First Order Low-Pass and High-Pass Filters using Op-Amp.
6. Design Second Order Low-Pass and High-Pass Filters using Op-Amp.
7. Design RC Phase Shift Oscillator using Op-Amp.
8. Design Wien Bridge Oscillator using Op-Amp.
9. Design of Square Wave and Triangle Wave Generators.
10. Study IC 555 as Astable Multivibrator.
11. Study IC 555 as Monostable Multivibrator.
12. Study the operation of 565 PLL with a given free running frequency.
13. Study line and load regulation using three-terminal regulators.

Suggested Reading:

1. Thomas Floyd, Electronic Devices, Pearson
2. Gayakwad, Op-Amps and Linear Integrated Circuits, Pearson
3. Coughlin and Driscoll, Operational Amplifiers and Linear Integrated Circuits, Prentice Hall
4. Microelectronic Circuits, Sedra and Smith, Oxford University Press

Semester 3rd

Skill Enhancement Course

Course Title: Repair and Maintenance of Electronic Appliances-II
Course Code: ELT322S
Credits 04 (Theory- 02; Practical- 02)

Course Objectives:

To equip students with the knowledge of maintenance and repair of various home appliances such as Air conditioner, Refrigerator, Microwave oven, Washing machine.

Learning outcomes:

1. *The students will be able to identify and handle various tools used for repair and maintenance of electronic equipments.*
2. *The students will be able to test and identify various kinds of faults in various domestic appliances like AC, refrigerator, Washing machine and microwave oven.*
3. *The students will be able to rectify various problems by replacing various electronic components in such appliances.*

Unit I:

Soldering & desoldering techniques: Types of PCBs, soldering Iron, soldering wire, Soldering flux, Soldering Materials. Zero defect soldering, Desoldering pump, Temperature controlled soldering station. Electrostatic discharge (ESD) and Heat Sink, Good soldering practices.

Tools and equipment used: Screw Driver Set, Tweezers, Different Types of Tweezers, Nose Pliers, Wire Cutter, Hot air gun, Liquid solder pest, Magnifying Lamp and Measuring Tools, Brush, CRO, Nipper, Test and Measurement Equipment: Multimeter operation etc.

Unit II:

Ac & Refrigerator: Principle and working of refrigeration system, Compressor, condenser condenser, evaporator, Refrigerant control devices, preventive maintenance and fault finding, rectification of various faults, Types of domestic ac machines,

Microwave oven: properties of microwaves, Microwave oven block diagram and working principle Fault identification, Repair and Maintenance. **Washing Machines**: Electronic control, Washing machine hardware, types of washing machines, Fault finding and repairing & maintenance of washing machine.

Co-ordinator

Recommended books:

1. Practical electronics: Components and techniques, John M. hughes, O'reily Media Inc., 2015
2. Practical Electronic fault finding and troubleshooting, Robin pain, Newnes Reed eduction and professional publishing.

Co-ordinator

Government Degree College, Baramulla

SEMESTER 1-3 **MULTIDISCIPLIANRY COURSE**

Course Title: Introduction to Electronics

Code: ELT022I

CREDIT: 03: 01 + 02

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 (Internal Examination Only)

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 (External Examination)

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 (External Examination)

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:

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