ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VII SEMESTER   **PHYSICS**   TIME:3Hrs/week
PH7405(4)   **ANALOG AND DIGITAL ELECTRONICS**   Max.Marks:100
w.e.f. 20AH Batch   **SYLLABUS**

Course Objectives:

❖ *To develop students' skills in designing, analyzing, and testing both analog and digital circuits and modulation techniques in Communication Electronics.*

Course Outcomes:

Upon the successful completion of the course, students will be able to:

❖ *CO1: Analyze the structure and working of FET, JFET, MOSFET, CMOS circuits, And characteristics and applications of UJT as a relaxation oscillator.*
❖ *CO2: Explain the block diagram of a typical Op-Amp and its role in various applications and determine various parameters.*
❖ *CO3: Analyze and design basic circuits using various types of diodes, solar cells, LEDs and semiconductor lasers, and know the principles of operation and applications.*
❖ *CO4: Develop and analyze the functioning of basic combinational and sequential logic circuits, and know their functioning and applications.*
❖ *CO5: Describe basic digital communication systems using modulation, and sampling techniques, and know the principles of functioning and applications.*

SYLLABUS

UNIT–I: Introduction to Electronic Devices: 7Hrs

 Field Effect Transistor (FET): Structure and working - JFET Structure and working, Structure of MOSFET and Characteristics, , Concept of CMOS Structure and working -Characteristics of UJT. Application of UJT as a Relaxation oscillator.

UNIT–II: Operational Amplifiers: 8 Hrs

Block diagram of a typical Op-Amp, differential Amplifier, Comparator open loop configuration, inverting and non-inverting amplifiers. Op-amp with negative feedback, voltage shunt feedback, effect of feedback on closed loop gain, input resistance, output resistance, CMRR, frequency response, slew rate.

UNIT- III: Junction Diodes   7 Hrs

Tunnel diode- I-V characteristics, Schottky barrier diode - operation and applications. Varactor diode, Gunn diode, IMPATT diode, TRAPATT diode, BARITT diode - Solar cell – Structure - Principle of operation – Light Emitting Diodes (LEDs), Semiconductor lasers – principle of operation and applications.

UNIT–IV: Digital Electronics   8 Hrs

Combinational Logic: Multiplexers, Decoder, Demultiplexer, Data selector, Multiplexer, Encoder. Sequential Logic: Flip–Flops, A1-bit memory, The RS Flip-Flop, JK Flip – Flop, JK Master Slave Flip–Flops, T Flip-Flop, D Flip-Flop, Shift Registers,- Asynchronous and Synchronous Counters.

UNIT–V: Communication Electronics   8 Hrs

Introduction to Modulation (AM & FM), Sampling Theorem, Low pass and Band pass signals, PAM, Channel BW for a PAM signal. Natural sampling, Flattop sampling. Signal recovery through holding. Differential PCM, Delta Modulation, Adaptive Delta modulation CVSD. Signal to noise ratio in PCM and Delta Modulations.

List of Activities:

1.   Assignments

2.   Student Seminars

Recommended Books

1.   OP-Amps & Linear Integrated Circuits, by Ramakanth A. Gayakwad, PHI, 2nd Edition, 1991.

2.   Digital Systems by Ronald J. Tocci, 6thEdition, PHI, 1999.

3.   Principles of Communications by Taub and Schilling, Mc-Graw Hill Publication.

4.   Electronic Principles by Malvino, 6thEd.TMH, 2017

5.   Linear Integrated circuits by Roy Choudhry, Pearson,2018

6.   Op-Amps – D.K. Mahesh, PHI

7.   Basic Electronics by Chinmoy Saha , Cambridge University press

Reference Books

8.   Micro Electronics by Milliman and Halkias. TMH Publications

9.   Digital Principles and Applications by A.P. Malvino and Donald P.Leach, Tata McGraw- Hill, New Delhi, 1993

10.   Electronic Devices and Circuit Theory by Robert Boylested and Louis Nashdsky–Jose Kanedy & Division. PHI, New Delhi, 1991

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
VII SEMESTER   **PHYSICS**   TIME:3Hrs/week
 PH 7455(4)   **Analog and Digital Electronics - Practical**   Max.Marks:100
w.e.f. 20AH Batch   **SYLLABUS**

Course Objectives:

  ❖ *To equip, students with experimental skills, by applying the learnt concepts from Analog and Digital Electronics.*

Course Outcomes:

Upon the successful completion of this practical course, students will be able to:

  ❖ *CO1: Study the FET Characteristics and determine the respective parameters.*
  ❖ *CO2: Study the UJT Characteristics and determine and determent the respective parameters.*
  ❖ *CO3: Design Astable Multivibrator using 555-Timer and determine the frequency of oscillation and duty cycle.*
  ❖ *CO4: Determine the resonant frequency of oscillation of a Wien's Bridge Oscillator using Op-Amp.*
  ❖ *CO5: Study the characteristics of operational amplifier and determine the following parameters (a) Input offset voltage, (b) Input bias current, (c) CMRR*
  ❖ *(d) Slew rate.*
  ❖ *CO6: Study the characteristics of Op-Amp as an integrator, Differentiator & Summation performer*
  ❖ *CO8: Design and verify the truth tables of half adder and full adder circuits.*
  ❖ *CO9:Design and verify the truth tables of various flip flops circuits (RS,D,JK, T).*

Any six of the following experiments:

List of Experiments:

1.   FET Characteristics

2.   UJT Characteristics

3.   555-Timer – Astable Multivibrator

4.   Wien Bridge Oscillator-using Op-Amp

5. Op-amp parameters

(a) Input offset voltage

(b) Input bias current

(c) CMRR

(d) Slew rate

6. OP-AMP-offset null adjustment-inverting Amplifiers

7. Op-Amp-integration, Differentiation & Summation

8. Design and study of full adder and half adder circuits

9. Design and study of various flip flops circuits (RS, D, JK, T)