CMR Engineering College

Affiliated to JNTU, Hyderabad and Approved by AICTE-New Delhi

## Department of Electronics and Communication Engineering

# LAB IMPROVEMENT PROGRAM FOR FUTURE TRENDS (LIFT) MANUAL

## (2018-19)

## (I SEM)

# A Guide for execution of Lab Courses

## VISION OF THE INSTITUTE:

To be recognized as a premier institution in offering value based and futuristic quality technical education to meet the technological needs of the society.

## MISSION OF THE INSTITUTE:

- To impart value based quality technical education through innovative teaching and learning methods.
- To continuously produce employable technical graduates with advanced skills to meet the current and future technological needs of the society.
- To prepare the graduates for higher learning with emphasis on academic and industrial research.

# DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

## VISION

To promote excellence in technical education and scientific research in electronics and communication engineering for the benefit of society.

## MISSION

- To impart excellent technical education with state of art facilities inculcating values and lifelong learning attitude.
- To develop core competence in our students imbibing professional ethics and team spirit.
- To encourage research benefiting society through higher learning.

## PROGRAMMES EDUCATIONAL OBJECTIVES

- PEO 1: Excel in professional career & higher education in Electronics & Communication Engineering and allied fields through rigorous quality education.

- PEO 2: Exhibit professionalism, ethical attitude, communication skills, team work in their profession and adapt to current trends by engaging in lifelong learning.
- PEO 3: Solve real life problems relating to Electronics & Communication Engineering for the benefits of society.

## PROGRAM OUTCOMES (POs)

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, social, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

# LAB IMPROVEMENT FOR FUTURE TRENDS PROGRAMME (LIFT)

## INDEX

# GUIDELINES FOR LAB IMPROVEMENT FOR FUTURE TRENDS (LIFT PROGRAMME)

## I. Aim of the Lift Programme:

The main aim of the Lift programme in laboratory is to innovate, modify the existing facilities in labs, to create awareness among the students and develop Industry –Institution interactions and reach the standards in laboratories.

## II. Functions of the Lift Programme:

(i) To create better understanding among all the staff and lab staff / technicians about the concepts of Lift and other lab related activities.

(ii) To Prepare Gap Analysis: This involves collection of requirements from each Lab of every department, information about expansion of labs, repairs and maintenance of labs etc.

(v) To arrange Industrial Visits: A lab and lift related industrial visit will be organized in a year for II or III year students and a report is to be submitted by all the students who visited that particular industry.

(vi) A report on Smart (Shadow) Engineering: This involves arrangement of Industrial practical learning, submission of Industrial visit report, Technical Survey reports and Market Survey of a product for development in laboratories.

(vii) Verification of all the laboratories in every department by Lift Team along with the Principal and Concerned HODs to check whether the activities are going according to Lift guidelines, record keeping, Lab Manuals and Viva sessions etc.

(viii) Check for LEAD Experiments and its follow up

(ix) Submission of proposals related to R&D, Project and Consultancy from lab staff to Principal Sir for further approvals.

## LAB IMPROVEMENT FOR FUTURE TRENDS PROGRAMME (LIFT CONCEPT)

### 1. OBJECTIVES AND RELEVANCE:

The main aim of the Lift programme in laboratory is to innovate, modify the existing facilities in labs, to create awareness among the students and develop Industry Institution interactions and reach the standards in laboratories.

### 2. SCOPE:

The main scope of the Lift lab course is to cover all the experiments as per the schedule given in the prescribed week wise periods. With this, a student can better understand the concepts and operating systems so that he could be able to get better knowledge about each lab.

### 3. PREREQUISITES:

The basic level idea related to each experiment should be provided to the students before conducting main lab course Following details are to be explained related to experiment:

a. Introduction to experiment – 30 min
b. Operating of the equipment/instrument/software
c. Record of Experimental results.
d. Sample Calculations / Executable Programmers

### 4. SYLLABUS AS PER JNTUH:

The lab course should be planned as per the JNTUH syllabus. In this, LEAD experiments should also be included in cycle of experiments.

### 5. GUIDELINES FOR LEAD EXPERIMENT:

a. A Lead Experiment is selected apart from all the other experiments that covered in JNTUH Syllabus.
b. This experiment is exclusively new idea with the background from the rest of the experiments that continuously running in each laboratory.
c. Lead experiment should utilize the existing resources within the laboratory itself.
d. Every student should aware of Lead Experiment and himself involved in doing and knowing about the experimental technique.
e. A separate page is provided to record lead experiment in record book stating all details like Aim, Procedure and Record of Results.
f. A Lead experiment should be a unique one from all the other experiments.

g. Each Lab Staff / Technicians must clearly explain all the students about the concept of LEAD Experiment and make them understand before going to that Experiment.

## 6. VIRTUAL LAB EXPERIMENT

The Virtual Laboratory is an interactive environment for creating and conducting simulated experiments: a playground for experimentation. To enthuse students to conduct experiments by arousing their curiosity. This would help them in learning basic and advanced concepts through remote experimentation.

## 7. SUGGESTED BOOKS:

The suggested books should be recommended to the students as per the JNTUH syllabus prescribed.

## 8. WEBSITES (USEFUL LINKS):

The useful links should be provided to the students, where they can get easily accessing the knowledge of the experiment.

## 9. EXPERT DETAILS:

The expert details should be provided based on the experimental importance.

## 10. a. LAB SCHEDULE

The lab schedule should be provided to the students before coming to lab. They will know the next experiments to be conducted for that batch.

## b. VIVA SCHEDULES:

An exclusive viva will be conducted for all the students to test their knowledge, ability to pick up from the experimental techniques, skill development in laboratories. This viva will be organized depending upon sessions schedule in each lab.

## c. SCHEME OF EVALUATION

The students will know the individual marks evaluation for internal and external lab exams.

## 11. PROJECT/PRODUCT/PAPER BASED LEARNING

Proposal of project with extended abstract, Block Diagram / Circuit / Flow diagram and clear references may be presented and executed.(or)

A product of utility may be proposed to develop for in house usage / industrial requirements may be useful for any outside agency that can be marketable in order to generate revenue through consultancy. (or)

An article/white paper from a magazine /journal/weekly/any periodical in the entitled Subject

## 12. MAPPING OF LAB WITH PROJECT/CONSULTANCY/R & D:

The lab course should be designed in such a way that it should meet the requirements of research and development as well as consultancy projects. Also the Proposals of Project/R&D/Consultancy are as follows:

Proposal 1: Project Design & Execution.
Proposal 2: R& D Level Project Design & Execution.
Proposal 3: Consultancy Task / Project Design & Development.

### a. PROPOSAL FOR R & D ACTIVITY:

1. An exact paper from a National / International journal in this entitled area / subject / area (IEEE Format)

AND/OR

2. An article / white paper from a magazine / journal / weekly / any periodical in the entitled Subject.

AND/OR

3. An Advanced technology development / proposal / article publication from any source of information.

### b. PROPOSAL FOR PROJECT ACTIVITY:

A Proposal of a hobby/mini/proto/general/model/proto type project with extended abstract, Block Diagram/Circuit/Flow diagram and clear references may be presented and executed.

### GUIDELINES FOR HOBBY/INCUBATION ACTIVITY:

A. A Hobby project/activity is necessary for staff as well as the students to improve Ones individual skills in laboratory work.

B. This Project consists of selecting the suitable innovation in existing theory or Practical with each lab and suggest for proposals within the scope of the organization.

C. After proposals are subjected to preliminary acceptance, then final proposals and budgeting will be started out.

D. In view of this hobby project, a proposal is made jointly either from students or Both students and staff and submit abstract along with block or flow diagram stating the applications and suitability in lab. This project will be sent for further approvals.

**c. PROPOSAL FOR CONSULTANCY:**

A programme / machine / product of utility may be proposed to develop for in house usage / industrial requirements may be useful for any outside agency that can be marketable in order to generate revenue through consultancy.

## 13. GUIDELINES FOR SHADOW ENGINEERING(VIP)

### INDUSTRIAL VISITS (IIP – INNOVATIVE INDUSTRIAL LEARNING ROGRAM):

### OBJECTIVES OF SHADOW ENGINEERING:

1. The program which uplifts the knowledge of the students related to laboratories.
2. To improve the industry-college interactions.
3. To create industry like environment for all the students in order to make future Assignment.
4. This program leads to matrixing with the students.

### PROPOSALS (WEEK WISE INDUSTRIAL VISITS) (IN HOUSE OR OUTSIDE VISIT)/TRAINING PROGRAMMES:

**TABLE 1: INDUSTRIAL VISITS**

| S.No | Type of industry | Nature of industry | Date of visit | No. of students participated | Year/branch | Remarks |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |

**TABLE 2: INDUSTRIAL TRAINING (Smart Engg)**
**(Career Visit Approval)**

| S.no | Name of the Course | Nature of industry | Duration of Training | Authority | Date of Training/Certificate No. | Remarks |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |

## 14. ACTIVITIES IN LIFT PROGRAM

### CALIBRATION/INSTALLATION AND TESTING:

Calibration: Aim of this concept is to check:
i. Whether all the equipment is functioning correctly as per the standards.
ii. To bring correctness in the errors of instrument or equipment.
iii. To rectify the errors if any.

Installation: Aim of this concept is to make and maintain installation procedure for a new equipment or already existing equipment

Testing : Aim of this concept is to test the equipment after installation whether it meets the existing standards.

**After calibration the details of equipment should be submitted in following format:**

| S.no | Type of equipment | Certificate no | Certificate issued by | Date of calibration | Date of calibration due | Remarks |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |

### 15. MAINTAINANCE AND TROUBLE SHOOTING SCHEDULES:

A proposal is to be made from each lab branch wise. The proposal should carry following details related to specific equipment in lab.

S.No, Equipment Name, Type of Problem (Too much Noise, Abnormal Sound, Corrupt Software, Anti Virus Problem, Missing of Display, CRT not working, Motor is not giving signal, Digital display is not working, Break of tools, Misalignment of machine elements, PLC is not

properly working), Expected Reasons (Bearing failure, Improper alignment of machine centers, Missing of vibration pads etc)

**Trouble shooting exercises should be properly recorded in a separate format as mentioned below:**

| S.No. | Date of recording activity | Equipment Name | Type of Trouble | Remedial Activity | Remarks |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

## 16. Laboratory Additional Activity Coverage

**A. Learn Emerging Advancements in the Domain (LEAD) Experiments:**

| Sl.No. | Activity | Date of Coverage | Sign. Of Faculty | Remarks |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

**B. Trouble shooting Activity :**

| Sl.No. | Activity | Date of Coverage | Sign. Of Faculty | Remarks |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

**C. Calibration / Testing / Installation Activity :**

| Sl.No. | Activity | Date of Coverage | Sign. Of Faculty | Remarks |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

**D. Project / Consultancy /R&D Activity (if any):**

| Sl.No. | Activity | Date of Coverage | Sign. Of Faculty | Remarks |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

# NAME OF THE LABORATORIES

| S.NO | YEAR-SEM | NAME OF THE LAB |
|---|---|---|
| 1. | II B.TECH – I SEM-R16 | BASIC SIMULATION |
| 2. | II B.TECH – I SEM-R16 | ELECTRONIC DEVICES AND CIRCUITS |
| 3. | II B.TECH – I SEM-R16 | BASIC ELECTRICAL AND ELECTRONICS |
| 4. | III B.TECH – I SEM-R16 | DIGITAL COMMUNICATIONS |
| 5. | III B.TECH – I SEM-R16 | LINEAR IC APPLICATIONS |
| 6. | III B.TECH – I SEM-R16 | DIGITAL IC APPLICATIONS |
| 7. | IV B.TECH – I SEM-R15 | MICROWAVE ENGINEERING &DIGITAL COMMUNICATIONS |
| 8. | IVB.TECH – I SEM-R15 | ADVANCED COMMUNICATION SKILLS |

# SUBJECTWISE LAB PLANNER

## BASIC SIMULATION LAB

**CONTENTS:**

## 1. OBJECTIVES AND RELEVANCE

The main objective of the lab course is to gain practical hands on experience by exposing the students to generate various signals and sequences ,convolution, correlation, Fourier transform, Laplace transform and Z transform on signals and sequences is to be performed.

## 2. SCOPE

Understanding of Basic simulation lab has the scope to make the learner comfortable to work in the area of Communication systems and also to implement various projects like monitoring and controlling applications.

## 3. PREREQUISITES

Theoretical knowledge on subject Signals and Stochastic process is required.

**PART - A**

**PREAMBLE**

This lab covers the experiments in Signals and Stochastic process subject. The JNTUH has given 18 experiments in the syllabus out of which fifteen experiments are compulsory.

## 4. SYLLABUS-JNTUHH

**UNIT-I**

**EXPERIMENT NO. 1**

To write a MATLAB program to perform some basic operations on matrices such as addition, subtraction, multiplication. (JNTUH SL.No.1)

**OBJECTIVE**

To perform some basic operations on matrices such as addition, subtraction, Multiplication.

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB
3. Open new M-file
4. Type the program
5. Save in current directory
6. Compile and Run the program
7. For the output see command window \ Figure window

**APPLICATIONS**

1. Signal processing
2. Digital communications

**EXPERIMENT NO. 2a**

To write a "MATLAB" Program to generate of continuous time signals like Unit Step, Sawtooth, Triangular, Sinusoidal, Ramp, and Sinc function. (JNTUH SL.No.2)

**OBJECTIVE**

To generate of continuous time signals like Unit Step, Saw tooth, Triangular, Sinusoidal, Ramp, and Sinc function.

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB
3. Open new M-file
4. Type the program
5. Save in current directory
6. Compile and Run the program
7. For the output see command window\ Figure window

**APPLICATIONS**

1. Signal processing
2. Digital communications

**EXPERIMENT NO.2b**

To write a "MATLAB" Program to generate of discrete time signals like unit Impulse, Unit Step, Unit Ramp, Exponential signal and Sinusoidal signals. (JNTUH SL.No.2)

**OBJECTIVE**

To generate of discrete time signals like Unit Impulse, Unit Step, Unit Ramp, Exponential signal and Sinusoidal signals.

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB
3. Open new M-file
4. Type the program
5. Save in current directory
6. Compile and Run the program
7. For the output see command window\ Figure window

**APPLICATIONS**

1. Signal processing
2. Digital communications

**EXPERIMENT NO.3**

To perform various operations on signals such as addition, multiplication, scaling, shifting and folding, computation of energy and average power using MATLAB program.

(JNTUH SL.No.3)

**OBJECTIVE**

To perform various operations on signals such as addition, multiplication, scaling, shifting and Folding, computation of energy and average power using MATLAB program.

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB
3. Open new M-file
4. Type the program
5. Save in current directory
6. Compile and Run the program
7. For the output see command window\ Figure window

**APPLICATIONS**

1. Signal processing
2. Digital communications

**EXPERIMENT NO.4**

To find the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal using MATLAB program. (JNTUH SL.No.4)

**OBJECTIVE**

To perform Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal using MATLAB program.

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB
3. Open new M-file
4. Type the program
5. Save in current directory
6. Compile and Run the program
7. For the output see command window\ Figure window

**APPLICATIONS**

1. Signal processing
2. Digital communications

**EXPERIMENT NO. 5a**

To write a matlab program to verify the given system is linear or non-linear.

(JNTUH SL.No.7)

**OBJECTIVE**

To perform whether the given system is linear or not.

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB
3. Open new M-file
4. Type the program
5. Save in current directory
6. Compile and Run the program
7. For the output see command window\ Figure window

**APPLICATIONS**

1. Signal processing

2. Digital communications

**EXPERIMENT NO. 5b**

To write a MAT Lab program to verify the given system is Time –invariant or Time variant. (JNTUH SL.No.7)

**OBJECTIVE**

To perform whether the given system is Time –invariant or Time–variant.

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB
3. Open new M-file
4. Type the program
5. Save in current directory
6. Compile and Run the program
7. For the output see command window\ Figure window

**APPLICATIONS**

1. Signal processing
2. Digital communications

**EXPERIMENT NO.6**

To find the Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system and verifying its physical realiazability and stability properties using MATLAB program.

(JNTUH SL.No.8)

**OBJECTIVE**

To perform Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system and verifying its physical realiazability and stability properties using MATLAB program.

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB
3. Open new M-file
4. Type the program

5. Save in current directory
6. Compile and Run the program
7. For the output see command window\ Figure window

**APPLICATIONS**

1. Signal processing
2. Digital communications

**UNIT-2**

**EXPERIMENT NO.7**

To write a MATLAB program to perform Gibbs Phenomenon operation

(JNTUH SL.No.9)

**OBJECTIVE**

To perform the Gibbs Phenomenon operation

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB
3. Open new M-file
4. Type the program
5. Save in current directory
6. Compile and Run the program
7. For the output see command window\ Figure window

**APPLICATIONS**

1. Signal processing
2. Digital communications

**EXPERIMENT NO.8**

To find Fourier transform and inverse Fourier transforms of given functions.

(JNTUH SL.No.10)

**OBJECTIVE**

To perform the Fourier transform of the given functions.

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB
3. Open new M-file
4. Type the program
5. Save in current directory
6. Compile and Run the program
7. For the output see command window\ Figure window

**APPLICATIONS**

1. Signal processing
2. Digital communications

**EXPERIMENT NO. 9**

To write MATLAB program to find the convolution of two sequences (JNTUH SL.No.5)

**OBJECTIVE**

To perform convolution between two sequences

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB
3. Open new M-file
4. Type the program
5. Save in current directory
6. Compile and Run the program
7. For the output see command window\ Figure window

**APPLICATIONS**

1. Signal processing
2. Digital communications

**EXPERIMENT NO. 10**

To generate a MATLAB Program to verify sampling theorem**.** (JNTUH SL.No.14)

**OBJECTIVE**

To verify sampling theorem.

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB
3. Open new M-file
4. Type the program
5. Save in current directory
6. Compile and Run the program
7. For the output see command window\ Figure window

**APPLICATIONS**

1. Signal processing
2. Digital communications

**UNIT-3**

**EXPERIMENT NO. 11**

MATLAB program to plot the given waveform using waveform synthesis using Laplace transform. (JNTUH SL.No.11)

**OBJECTIVE**

To plot the given waveform using waveform synthesis using Laplace transforms.

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB
3. Open new M-file
4. Type the program
5. Save in current directory
6. Compile and Run the program
7. For the output see command window\ Figure window

**APPLICATIONS**

1. Signal processing
2. Digital communications

**EXPERIMENT NO. 12**

To Write a MATLAB program to draw Pole-Zero map in Z-Plane (JNTUH SL.No.12)

**OBJECTIVE**

To draw Pole-Zero map in Z-Plane

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB
3. Open new M-file
4. Type the program
5. Save in current directory
6. Compile and Run the program
7. For the output see command window\ Figure window

**APPLICATIONS**

1. Signal processing
2. Digital communications

**UNIT-4**

**EXPERIMENT NO.13**

To write a mat lab program to compute autocorrelation and cross correlation between signals. (JNTUH SL.No.6)

**OBJECTIVE**

To perform autocorrelation and cross correlation between two sequences

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB

3. Open new M-file
4. Type the program
5. Save in current directory
6. Compile and Run the program
7. For the output see command window\ Figure window

**APPLICATIONS**

1. Signal processing
2. Digital communications

**EXPERIMENT NO. 14**

To write a program to detect the periodic signal by Noise using Auto correlation and Cross Correlation method (JNTUH SL.No.16)

**OBJECTIVE**

To detect the periodic signal by Noise using Auto correlation and Cross Correlation Method.

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB
3. Open new M-file
4. Type the program
5. Save in current directory
6. Compile and Run the program
7. For the output see command window\ Figure window

**APPLICATIONS**

1. Signal processing
2. Digital communications

**EXPERIMENT NO. 15**

To write a program for removal of noise by correlation or Auto correlation.

(JNTUH SL.No.15)

**OBJECTIVE**

To find removal of by Noise by using Auto correlation and Cross Correlation method

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB
3. Open new M-file
4. Type the program
5. Save in current directory
6. Compile and Run the program
7. For the output see command window\ Figure window

**APPLICATIONS**

1. Signal processing
2. Digital communications

**EXPERIMENT NO. 16**

To Write a MATLAB program to Checking a Random Process for Stationarity in Wide sense (JNTUH SL.No.18)

**OBJECTIVE**

To perform the Checking a Random Process for Stationarity in Wide sense using MATLAB

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB
3. Open new M-file
4. Type the program
5. Save in current directory
6. Compile and Run the program
7. For the output see command window\ Figure window

**APPLICATIONS**

1. Signal processing
2. Digital communications

**UNIT 5**

**EXPERIMENT NO. 17**

To Write a MATLAB program for Verification of Weiner-Khinchine Relations. (JNTUH SL.No.17)

**OBJECTIVE**

To perform the Verification of Weiner-Khinchine Relations using MATLAB

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB
3. Open new M-file
4. Type the program
5. Save in current directory
6. Compile and Run the program
7. For the output see command window\ Figure window

**APPLICATIONS**

1. Signal processing
2. Digital communications

**EXPERIMENT NO. 18**

To Write a MATLAB program to Generate the Gaussian noise (Real and Complex), Computation of its mean, M.S.Value and its Skew, Kurtosis, and PSD, Probability Distribution Function. (JNTUH SL.No.13)

**OBJECTIVE**

To perform the Generation of Gaussian noise (Real and Complex), Computation of its mean, M.S. Value and its Skew, Kurtosis, and PSD, Probability Distribution Function using MATLAB

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB
3. Open new M-file

4. Type the program
5. Save in current directory
6. Compile and Run the program
7. For the output see command window\ Figure window

**APPLICATIONS**

1. Signal processing
2. Digital communications

**5. LEAD EXPERIMENT:**

**EXPERIMENT NO. 1**

To Write a MATLAB program to find impulse response of raised cosine filter.

**OBJECTIVE**

To find impulse response of raised cosine filter

**PREREQUISITES**

Basic knowledge of MATLAB is required.

**DESCRIPTION**

1. Introduction to experiment -30 min
2. Open MATLAB
3. Open new M-file
4. Type the program
5. Save in current directory
6. Compile and Run the program
7. For the output see command window\ Figure window

The raised-cosine filter is a filter frequently used for pulse-shaping in digital modulation due to its ability to minimize inter symbol interference (ISI). Its name stems from the fact that the non-zero portion of the frequency spectrum of its simplest form ($\beta = 1$) is a cosine function, 'raised' up to sit above the $f$ (horizontal) axis.

The impulse response of such a filter is given by:

$$h(t) = \frac{\mathrm{sinc}\left(\frac{t}{T}\right)\cos\left(\frac{\pi\alpha t}{T}\right)}{1-4\left(\frac{\alpha t}{T}\right)^2}$$

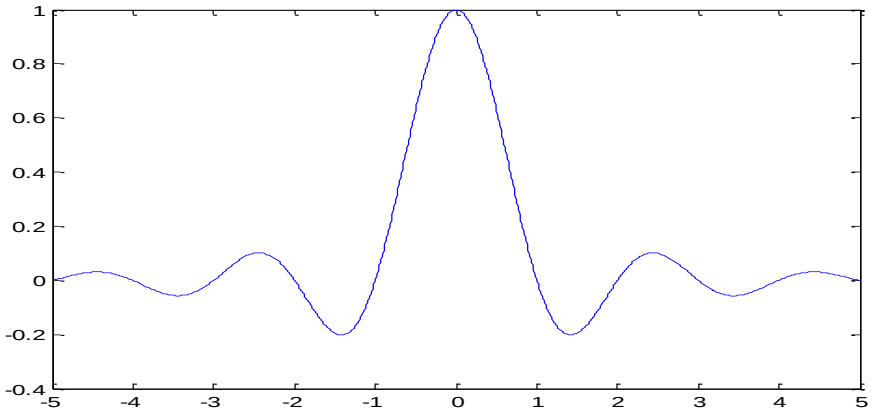
Raised Cosine FIR Filter
Impulse Response

in terms of the normalised sinc function.

**PROGRAM FOR IMPULSE RESPONSE OF A RAISED COSINE FILTER**

```
t=linspace(-5,5,1000);
b=0.2;
T=1;
h1=(sin(pi*t/T))./(pi*t/T);
h2=(cos(pi*b*t/T))./(1-(2*b*t/T).^2);
h=h1.*h2;
plot(t,h);
```

**RESULT:**




**APPLICATIONS**

1. Signal processing
2. Digital communications

**EXPERIMENT NO. 2**

To simulate simplified motion of a car, after a brief press of the accelerator pedal using Simulink tool in MATLAB.

## OBJECTIVE

To simulates simplified motion of a car, after a brief press of the accelerator pedal

## PREREQUISITES

Basic knowledge of Simulink tool in MATLAB is required.

## DESCRIPTION

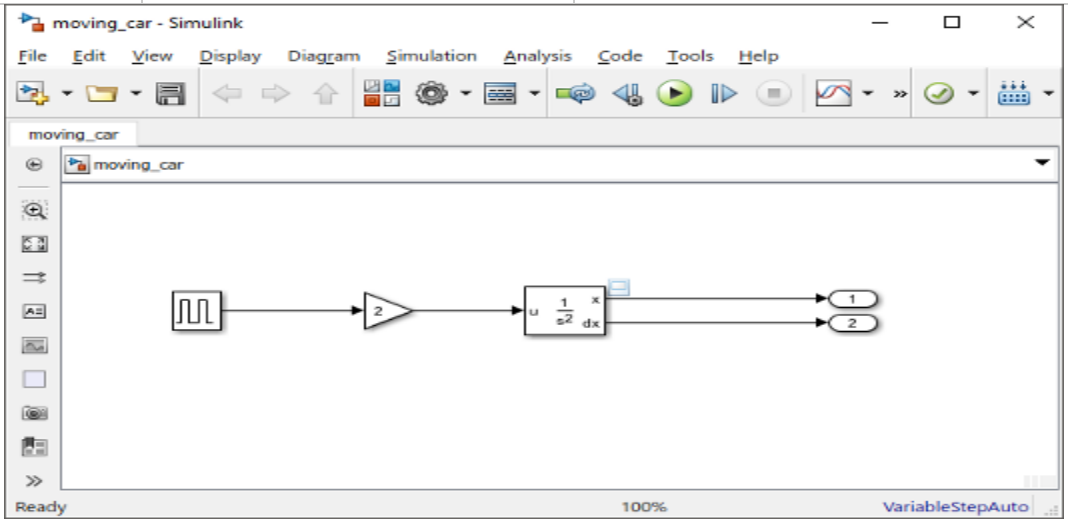
1. Introduction to experiment -30 min
2. Open Simulink in MATLAB

- **Model Overview**

The basic techniques you use to create a simple model in this tutorial are the same techniques that you use for more complex models. This example simulates simplified motion of a car, after a brief press of the accelerator pedal.

A Simulink block is a model element that defines a mathematical relationship between its input and output. To create this simple model, you need four Simulink blocks.

| Block name | Block Purpose | Model Purpose |
|---|---|---|
| Pulse Generator | Generate an input signal for the model | Simulate the accelerator pedal |
| Gain | Multiply the input signal by a factor | Simulate how pressing the accelerator affects the car's acceleration |
| Integrator, Second-Order | Integrate input signal twice | Obtain position from acceleration |
| Outport | Designate a signal as an output from the model | Designate the position as an output from the model |

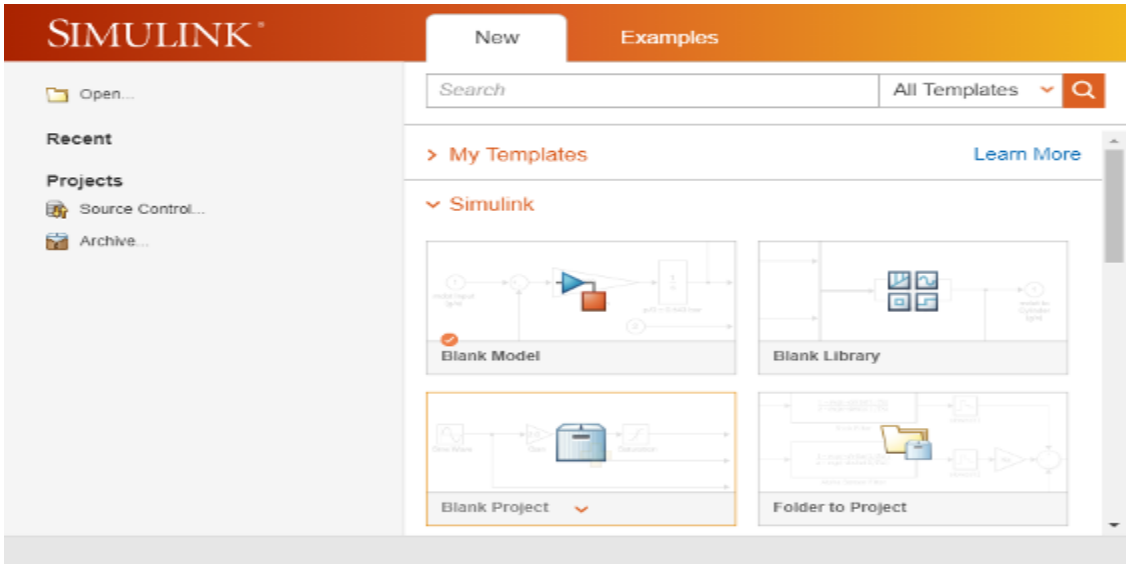


Simulating this model integrates a brief pulse twice to get a ramp and then displays the result in a Scope window. The input pulse represents a press of the accelerator pedal in a car, and the output ramp represents the increasing distance from the starting point.

- **Open New Model**

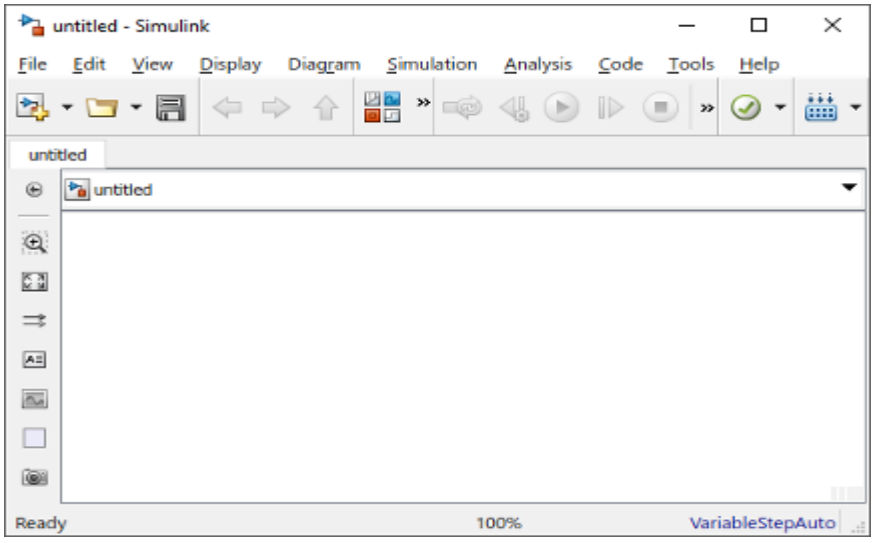
Use the Simulink Editor to build your models.

1. Start MATLAB®. From the MATLAB Toolstrip, click the **Simulink** button  .




2. Click the **Blank Model** template.

   The Simulink Editor opens.



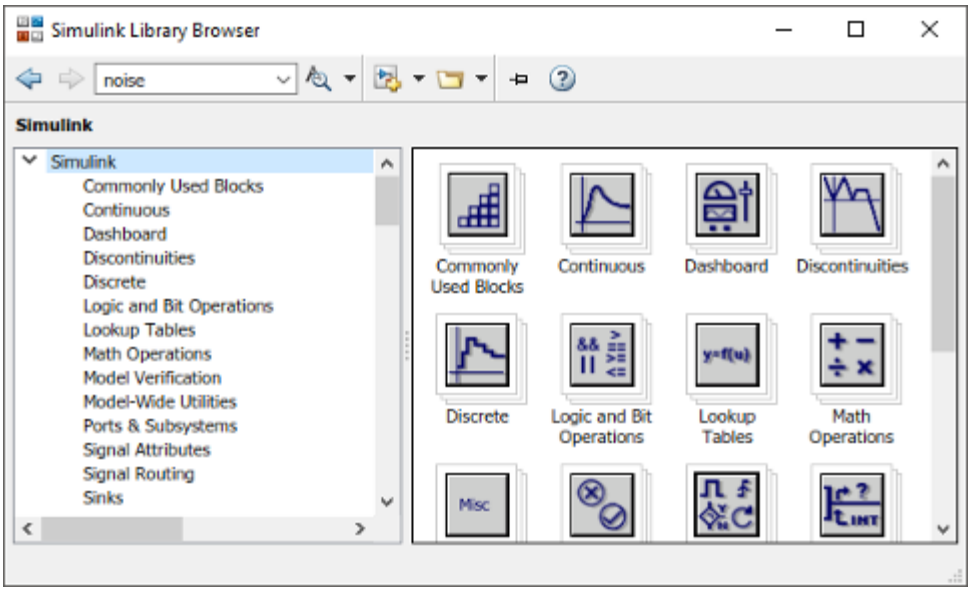

3. From the **File** menu, select **Save as**. In the **File name** text box, enter a name for your model, For example, `simple model`. Click **Save**. The model is saved with the file extension `.slx`.

- **Open Simulink Library Browser**

Simulink provides a set of block libraries, organized by functionality in the Library Browser. The following libraries are common to most workflows:

- Continuous — Building blocks for systems with continuous states
- Discrete — Building blocks for systems with discrete states
- Math Operations — Blocks that implement algebraic and logical equations
- Sinks — Blocks that store and show the signals that connect to them
- Sources — Blocks that generate the signal values that drive the model

1. From the Simulink Editor toolbar, click the **Library Browser** button .




2. Set the Library Browser to stay on top of the other desktop windows. On the Library Browser toolbar, select the **Stay on top** button .

To browse through the block libraries, select a MathWorks® product and then a functional area in the left pane. To search all of the available block libraries, enter a search term.

For example, find the Pulse Generator block. In the search box on the browser toolbar, enter `pulse`, and then press the Enter key. Simulink searches the libraries for blocks with `pulse` in their name or description, and then displays the blocks.

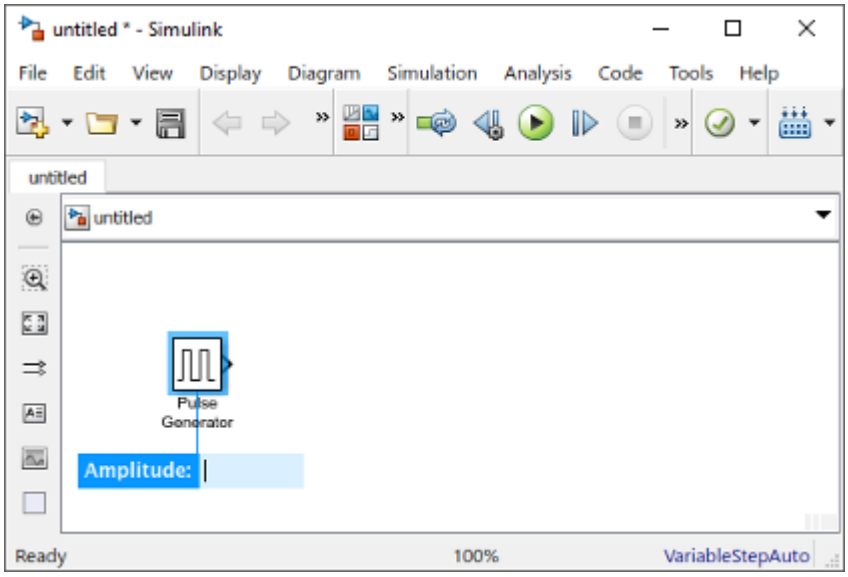
Get detailed information about a block. Right-click a block, and then select **Help for the Pulse Generator block**. The Help browser opens with the reference page for the block.

Blocks typically have several parameters. You can access all parameters by double-clicking the block.

- **Add Blocks to a Model**

To start building the model, browse the library and add the blocks.

1. From the Sources library, drag the Pulse Generator block to the Simulink Editor. A copy of the Pulse Generator block appears in your model with a text box for the value of the **Amplitude** parameter. Enter `1`.

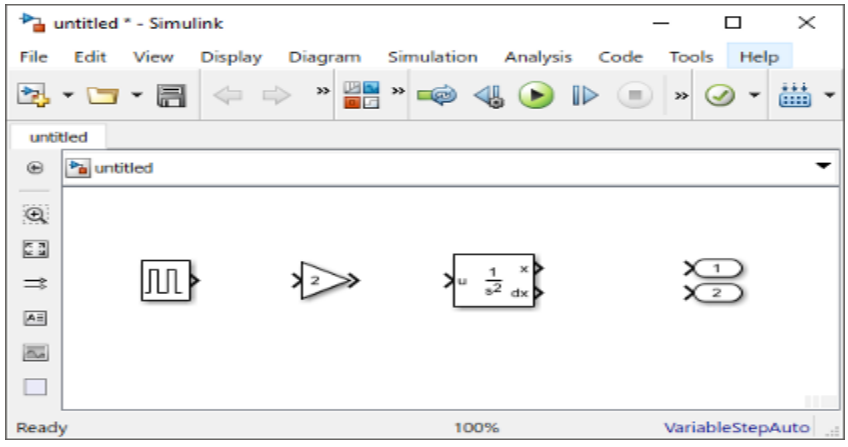



Parameter values are held throughout the simulation.

2. Add the following blocks to your model using the same approach.

| Block | Library | Parameter |
|---|---|---|
| `Gain` | `Simulink/Math Operations` | Gain: `2` |
| `Integrator, Second Order` | `Simulink/Continuous` | Initial condition: `0` |
| `Outport` | `Simulink/Sinks` | Port number: 1 |

3. Add a second Outport block right-clicking and dragging the existing one.
4. Your model should now have the blocks you need.
5. Arrange the blocks as follows by clicking and dragging each block. To resize a block, click and drag a corner.

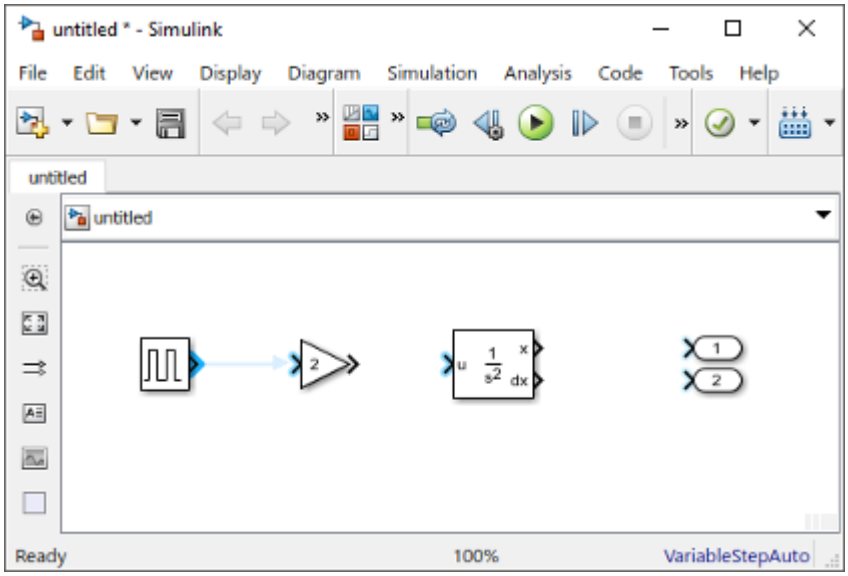


- **Connect Blocks**

Connect the blocks by creating lines between output ports and input ports.

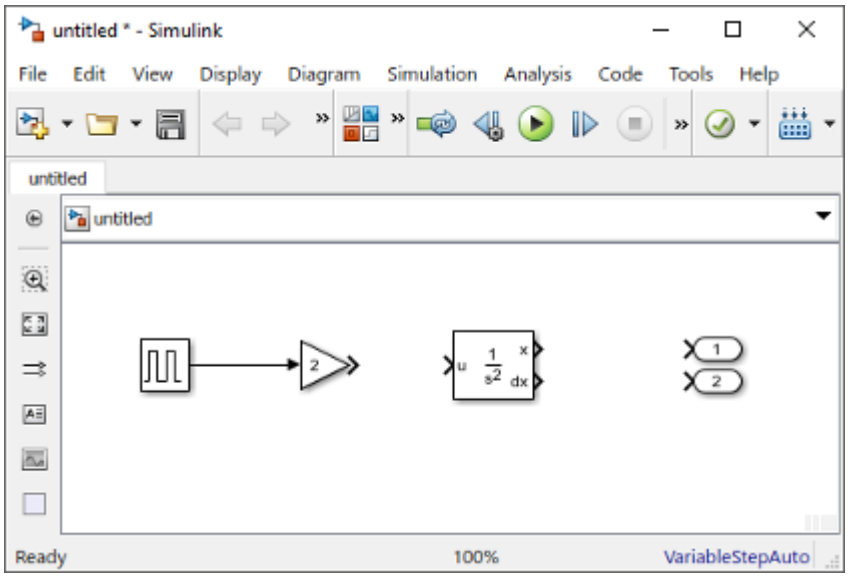
1. Click the output port on the right side of the Pulse Generator block.

   The output port, and all input ports suitable for a connection get highlighted.

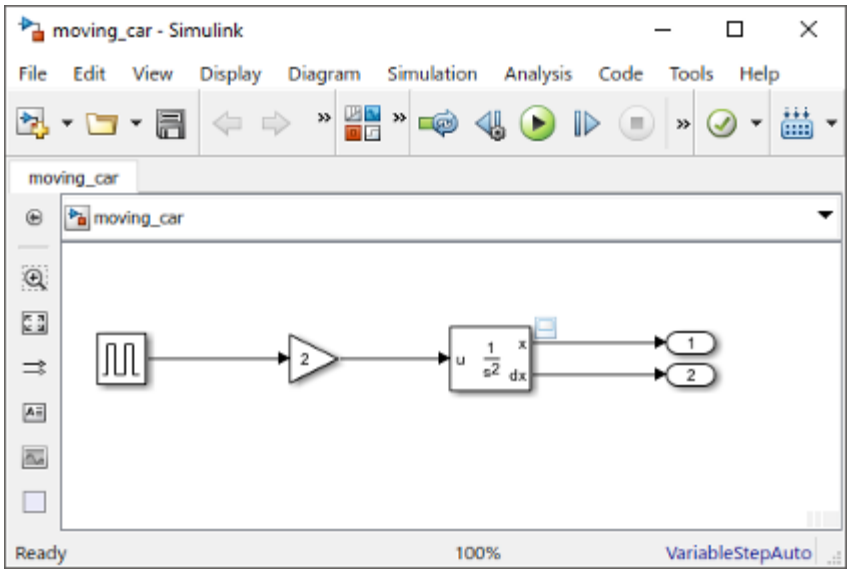



2. Click the input port of the Gain block.

   Simulink connects the blocks with a line and an arrow indicating the direction of signal flow.




3. Connect the output port of the Gain block to the input port on the Integrator, Second Order block.
4. Connect the two outputs of the Integrator, Second Order block to the two Outport blocks.
5. Save your model. Select **File** > **Save** and provide a name.

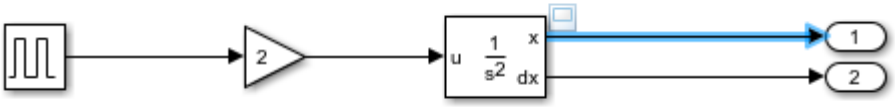



Your model is complete.

- **Add Signal Viewer**

To view the results, connect the first output to a Signal Viewer.

Access the context menu by right-clicking the signal. Select **Create & Connect Viewer > Simulink > Scope**. This creates a viewer icon on the signal, and opens a Viewer display.




You can open the viewer at any time by double-clicking the icon.

- **Run Simulation**

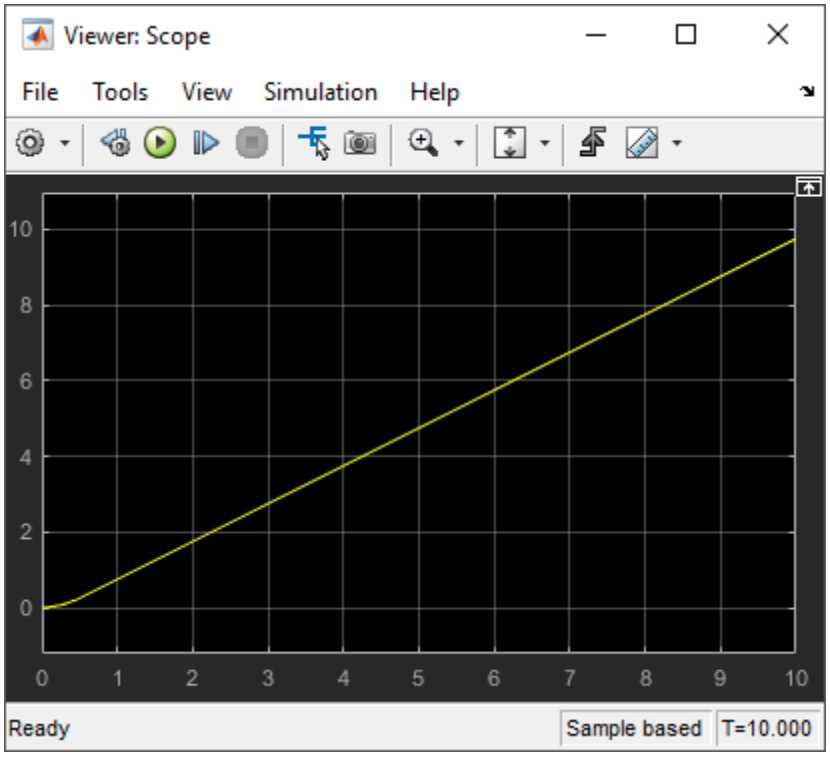
After you define the configuration parameters, you are ready to simulate your model.

1. On the model window, set the simulation stop time by changing the value at the toolbar.


The default stop time of `10.0` is appropriate for this model. This time value has no unit. Time unit in Simulink depends on how the equations are constructed. This example simulates the simplified motion of a car for 10 seconds.

2. To run the simulation, click the **Run** simulation button  .

The simulation runs and produces the output on the Viewer.




**APPLICATIONS**

1. Signal processing
2. Digital communications

## 6. VIRTUAL LAB EXPERIMENT:

OCTAVE is a freely distributed open source scientific software package, first developed by researchers from INRIA and ENPC, and now by the OCTAVE Consortium. It is similar to OCTAVE, which is a commercial product. Yet it is almost as powerful as OCTAVE. OCTAVE consists of three main components:

- an interpreter
- libraries of functions (OCTAVE procedures)
- libraries of Fortran and C routines

OCTAVE is specialized in handling matrices (basic matrix manipulation, concatenation, transpose, inverse, etc.) and numerical computations. Also it has an open programming environment that allows users to create their own functions and libraries.

This section is based on some user comments found in the internet, thus not necessarily all true. It is intended to give readers a general image about their differences besides those in syntax.

- OCTAVE has a thorough documentation; the one in OCTAVE is brief.

- OCTAVE has a lot of optimization on computation, thus it is faster than OCTAVE.
- OCTAVE has a very powerful simulation component called Simulink.
- OCTAVE has Scicos that serves the same purpose but it is weaker.
- OCTAVE has a much better integration with other programming languages and programs such as C, C++ and Excel.
- The graphics component of OCTAVE is weak (has fewer functions).
- Most importantly, OCTAVE is *FREE*. It certainly outweighs its deficiencies. It is remarked that OCTAVE is more than enough for casual and educational uses.

**Removal of noise by auto correlation:**

**Aim:** Removal of noise by auto correlation

## Equipments:

PC with windows (95/98/XP/NT/2000).

OCTAVE Software

## Program:-

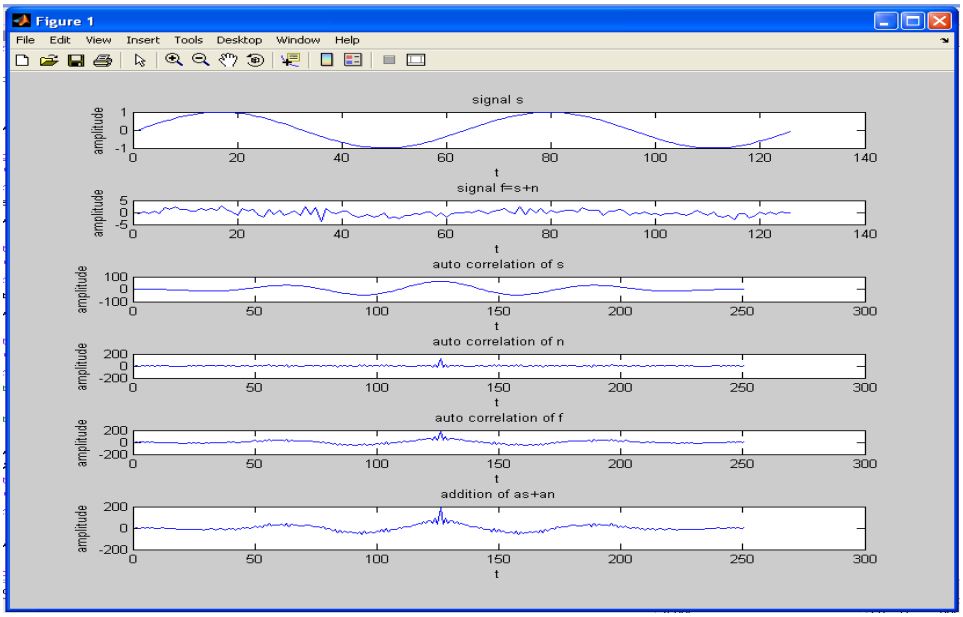
```
clear all

clc

t=0:0.1:pi*4;

s=sin(t);

k=2;

subplot(6,1,1)

plot(s);

title('signal s');

xlabel('t');

ylabel('amplitude');

n = randn([1 126]);

f=s+n;

subplot(6,1,2)

plot(f);
```

```
title('signal f=s+n');
xlabel('t');
ylabel('amplitude');
as=xcorr(s,s);
subplot(6,1,3)
plot(as);
title('auto correlation of s');
xlabel('t');
ylabel('amplitude');
an=xcorr(n,n);
subplot(6,1,4)
plot(an);
title('auto correlation of n');
xlabel('t');
ylabel('amplitude');
cff=xcorr(f,f);
subplot(6,1,5)
plot(cff);
title('auto correlation of f');
xlabel('t');
ylabel('amplitude');
hh=as+an;
subplot(6,1,6)
plot(hh);
title('addition of as+an');
xlabel('t');
```

```
ylabel('amplitude');
```

**Result:-**

In this experiment the removal of noise by auto correlation have been verified using OCTAVE




## 7. SUGGESTED BOOKS

1.Signals, Systems & Communications- B.P Lathi, BS Publications, 2003.
2.Signals & Systems – A.V.Oppenheim, A.S Willsky and S.H Nawab,PHI,2nd Edn
3.Signals & Systems-A.Rama Krishna Rao-2008,TMH
4. Signals & Systems-Simon Haykin and Van Veen, Wiley, 2nd Edn.
5. Fundamentals of Signals & Systems Michel J. Robert, MGH International Edn,2008
6.Introduction to signals and systems-K.Gopalan 2009,CENGAGE Learning
7.Signals, Systems and Transforms-C.L.Philips,J.M.Parr and Eve A.Riskin,3rd.,2004,PE
8.Signals, Systems using MATLAB-Chaparro,Academic press,2011
9.Signals and stochastic process-J.Mallikarjuna reddy-first edition-2016(PHI)

## 8. USEFUL LINKS

1. http://www.mathworks.in/support/books/book57482.html?category=11&language=1&view category
2.http://books.google.co.in/books/about/A_Guide_to_MATLAB.html?id=NekrOjT8oSIC&redirc=y
3.http://books.google.co.in/books?id=DEO3_9ZK-DgC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
4.https://en.wikibooks.org/wiki/MATLAB_Programming
5.http://www.e-booksdirectory.com/listing.php?category=585

## 9. EXPERTS' DETAILS

The expert details which have been mentioned below are only a few of the eminent on Known Internationally, Nationally and Locally.

### INTERNATIONAL

1. Prof.Yulin Wang-International School of Software, Wuhan University, China
2. Prof. George Constantine Giakos, The University of Akron, USA

### NATIONAL

1. Dr.Mahesh Chandra, Department of Electronics and Communication Engineering BIT Mesra, Ranchi, India
2. P.Ramesh babu, Assitant professor at saranathan college of engineering, trichy-12,Tamilnadu, India

### REGIONAL

1. Prof. N.S. Murthy, Dept. of ECE, NIT, Warangal.
2. P. Sri hari-Professor & Head of the Dept., Dept. of Electronics and Instrumentation Engg. GITAM University, Hyderabad

**10. (A) LAB SCHEDULE:** The lab schedule should be planned once in a week. The week wise scheduled experiment should be completed.

**CYCLE 1**

| **Batches** | **week-1** | **week-2** | **week-3** | **week-4** | **week-5** | **week-6** | week-7 |
|---|---|---|---|---|---|---|---|
| B1 | Demo | Exp.1 | Exp.2 | Exp.3 | Exp.4& Exp.5 | Exp.6 & Exp.7 | TEST |
| B2 | Demo | Exp.1 | Exp.2 | Exp.3 | Exp.4& Exp.5 | Exp.6 & Exp.7 | TEST |

**CYCLE 2**

| **Batches** | **week-1** | **week-2** | **week-3** | **week-4** | **week-5** | **week-6** | week-7 |
|---|---|---|---|---|---|---|---|
| B1 | Exp.8 | Exp.9 | Exp.10 | Exp.11& Exp.12 | Exp.13& Exp.14 | Exp.15 | TEST |
| B2 | Exp.8 | Exp.9 | Exp.10 | Exp.11& Exp.12 | Exp.13& Exp.14 | Exp.15 | TEST |

**(B) VIVA SCHEDULE:** The viva schedule should be planned prior starting to the lab experiment.

**ROUND -** 1

| **Batches** | **week-1** | **week-2** | **week-3** | **week-4** | **week-5** |
|---|---|---|---|---|---|
| B1,B2,B3 | Viva | | | | |
| B1,B2,B3 | | viva | | | |
| B1,B2,B3 | | | viva | | |
| B1,B2,B3 | | | | viva | |
| B1,B2,B3 | | | | | viva |

**ROUND -** 2

| **Batches** | **week-1** | **week-2** | **week-3** | **week-4** | **week-5** |
|---|---|---|---|---|---|
| SG1 | Viva | | | | |
| SG2 | | viva | | | |
| SG3 | | | viva | | |
| SG4 | | | | viva | |
| SG5 | | | | | viva |

*SG: Selected Group with a maximum of 6 or 12 students

**(C) SCHEME OF EVALUATION**

**INTERNAL LAB**

| Day to Day Evaluation ------ 15 Marks | | | | | Internal Exam ---10 Marks | | |
|---|---|---|---|---|---|---|---|
| Uniform | Observation & Record | Performance of experiment | Result | Viva Voce | Aim, Apparatus, Program, Procedure | Execution and Result | Viva Voce |
| 3M | 3M | 3M | 3M | 3M | 4M | 2M | 4M |
| **Total Marks:15+10=25 Marks** | | | | | | | |

**EXTERNAL LAB**

| Aim, Apparatus, Program, Procedure | Execution | Result | Viva Voce |
|---|---|---|---|
| 20M | 30M | 15M | 10M |
| **Total Marks:20+30+15+10=75 Marks** | | | |

## 11. PROJECT/PRODUCT/PAPER BASED LEARNING

**ARTIFACTS REMOVAL IN ECG SIGNAL**

**AIM:** Removing of Baseline Wandering In ECG Signal Using Derivative Based Filter.

**APPARATUS:**

MATLAB R2016b

PC

**THEORY:**

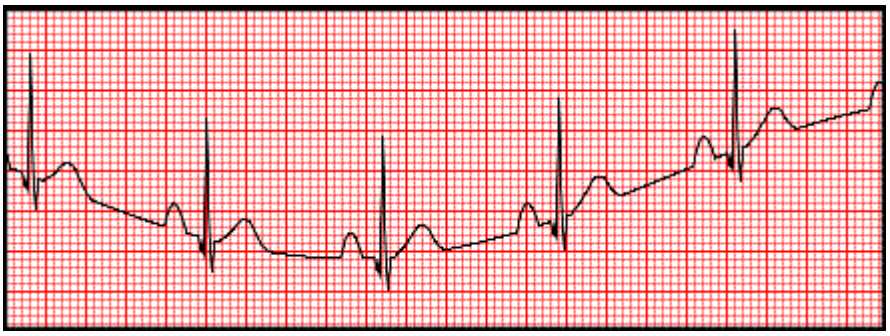
Artifact on the electrocardiogram can result from a variety of internal and external causes from Parkinsonian muscle tremors to dry electrode gel.Most of the time it will be obvious that you are dealing with artifact and troubleshooting the problem will be straight forward. However, there are occasions when artifact mimics ECG abnormalities that can cause problems for patient care. Once when I was a cardiac monitoring technician the alarm sounded and it appeared as though ventricular tachycardia was on the monitor. When we rushed to the patient's room it turned out she was brushing her teeth!With a trained eye you can often learn to spot the underlying rhythm "marching" through this type of artifact. Other times it's not that easy (PDF).Here are some types of artifact you may encounter along with some tips to help you achieve excellent data quality on your ECG tracings.

**Loose lead artifact**

You will frequently encounter loose lead artifact when dealing with patients who are diaphoretic because the electrodes simply will not stick to the patient's body. You may also see this type of artifact when placing the electrode over hair.To troubleshoot this problem make sure you prep the skin carefully!Consider tincture of benzoin. It works great for diaphoretic patients. However, tincture of benzoin is flammable! You don't want to use it for defibrillation pads.

**Wandering baseline artifact**

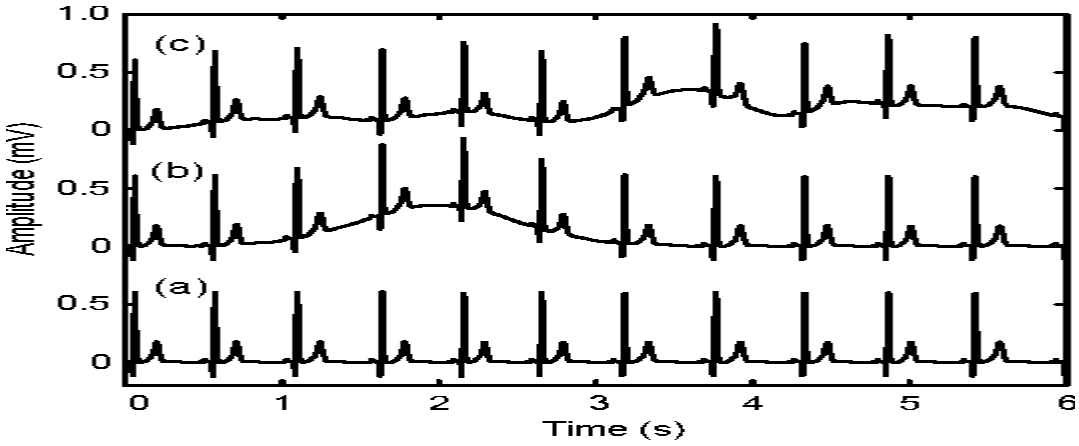
Wandering baseline artifact presents as a slow, undulating baseline on the electrocardiogram. It can be caused by patient movement, including breathing.I have also noticed that stopping or accelerating the ambulance can cause wandering baseline. Some references suggest that wandering baseline can be caused by loose or dry electrodes.Some paramedics ask patients to hold their breath while they capture a 12-lead ECG. I don't do this because it can alter the patient's heart rate.There are times when your patient is acutely short of breath and it's simply impossible to capture a 12-lead ECG with excellent data quality.



Base Line Wandering in ECG signal

## PRODUCRE:

1. ECG signal sampled at 1000Hz.
2. Take T.F Of a Filter. Here we are using Derivative filter.So use zeros.
3. Make sure that zeros should be at low frequencies(Notch Filter).
4. Location of zeros is given by Location of zeros is given by e^(+jw)=cosw+jsinw w=2*pi*($f_0/f_s$).
5. Zeros located at Z=1 and pole at Z=0.99 gives best results.




## 12. MAPPING OF LAB WITH PROJECT/CONSULTANCY/R & D:

The Basic simulation lab course should be designed in such a way that it should meet the requirements of research and development as well as consultancy projects. Also the Proposals of Project/R&D/Consultancy are as follows:

Proposal 1: R& D Level Project Design & Execution
Proposal 2: Project Design & Execution
Proposal 3: Consultancy Task / Project Design & Development

## PROPOSAL FOR R & D ACTIVITY:

### 1. An exact paper from a National/International journal in this entitled area/subject/area (IEEE Format)

### Text to Speech Conversion with Phonematic Concatenation

**Abstract**— This paper presents a method to design a Text to Speech conversion module by the use of Mat lab by simple matrix operations. Firstly by the use of microphone some similar sounding words are recorded using a record program in the Mat lab window and recorded sounds are saved in .wav format in the directory. The recorded sounds are then sampled and the sampled values are taken and separated into their constituent phonetics. The separated syllables are then concatenated to reconstruct the desired words. By the use of various Mat lab commands i.e. wavread, subplot etc. the waves are sampled and extracted to get the desired result. This method is simple to implement and involves much lesser use of memory spaces.

Keywords-Text to Speech Conversion: Phonematic Concatenation; Sample

## PROPOSAL FOR PROJECT ACTIVITY :

### Design and analysis of FIR digital filter based on Matlab

**Abstract**

In digital control system, interference, which is mixed in the input signal, has a great influence on the performance of the system. Therefore, processing of input signal has to be done to get useful signal. Finite impulse response (FIR) filter plays an important role in the processing of digital signal. Designing the FIR filter by Matlab can simplify the complicated computation in simulation and improve the performance. By using the method of window function technique, the design of FIR filter has been processed by Matlab.

## PROPOSAL FOR CONSULTANCY:

A proposal has been made to implement the following project using MATLab for Magni5 Technologies Pvt. Ltd, Hyderabad.

### ECG RECOGNITION SYSTEM BY USING HMM

**ABSTRACT**

**I**n this study, biomedical diagnosis system pattern recognition with normal and abnormal classes has been developed. First, future extraction processing was made by using the Doppler Ultrasound. During future extraction stage, Wavelet transforms and short time Fourier transform were used. As next step, Wavelet entropy were applied to these features. In the classification stage, Hidden Markov Model (HMM) was used. To compute the correct classification rate of proposed HMM classifier, it was compared to ANN by data set containing 215 samples. In our experiments specificity and sensitivity rate of proposed HMM classifier system with fuzzy C means (FCM)/K–means algorithms were found as 92% and 97.26% respectively. The present study shows that proper selection of this HMM's initial parameter values according to FCM/K-means algorithm improves the recognition rate of the proposed system which was also compared to our previous study named ANN.

**FUNDED/UNFUNDED PROPOSALS (if any)**

PROPOSAL FOR SDP:
TITLE: OPTIMIZATION TECHNIQUES IN MATLAB-MATHWORKS
OBJECTIVE: This SDP program is intended to bring down the awareness among all Staff in Order to study the various optimization techniques in Matlab.

## 13. GUIDELINES FOR SHADOW ENGINEERING (VIP)

### INDUSTRIAL VISITS (IIP – INNOVATIVE INDUSTRIAL LEARNING PROGRAM):

**OBJECTIVES OF SHADOW ENGINEERING:**

1. The program which uplifts the knowledge of the students related to laboratories.
2. To improve the industry-college interactions.
3. To create industry like environment for all the students in order to make future Assignment.
4. This program leads to matrixing with the students.

**PROPOSALS (WEEK WISE INDUSTRIAL VISITS) (IN HOUSE OR OUTSIDE VISIT)/TRAINING PROGRAMMES:**

**TABLE 1: INDUSTRIAL VISITS**

| S.no | Type of industry | Nature of industry | Date of visit | No. of students participated | Year/branch | remarks |
|---|---|---|---|---|---|---|
| 1 | TV station | Broadcasting | | 60 | II/1V I SEM | |
| | | | | | | |

## 14. CALIBRATION/INSTALLATION AND TESTING:

**CALIBRATION:** Aim of this concept is to check,

i. Whether all the equipment is functioning correctly as per the standards
ii. To bring correctness in the errors of instrument or equipment
iii. To rectify the errors if any

**INSTALLATION:** Aim of this concept is to make and maintain installation procedure for a new equipment or already existing equipment.

**TESTING:** Aim of this concept is to test the equipment after installation whether it meets the existing standards.

**Case 1: Calibration of Equipment**

The basic simulation lab is based on MAT Lab software so that calibration is not required

**Case 2: Installation of Equipment**

Installation of MAT Lab software is done and is maintained

**Case 3: Testing of Equipment**

As of now no testing of equipment or software's is required.

## 15. MAINTAINANCE AND TROUBLESHOOTING:

### (A) TROUBLE SHOOTING SCHEDULES:

A proposal is to be made from each lab branch wise. The proposal should carry following details related to specific equipment in lab.

The basic simulation lab consists of 30 systems all are working in good condition.

## 16. ASSESSMENT AND ACCREDITATION PROCESDURE AS PER NABL

Accreditation is the formal recognition, authorization and registration of a laboratory that has demonstrated its capability, competence and credibility to carry out the tasks. It provides the feedback to laboratories as to whether they are performing according to technical competence as per guidelines of NABL (National Accreditation Board for Testing and Calibration Laboratories)

The laboratory should carry out the following important tasks towards getting ready for accreditation from NABL.

1. Preparation of methodology in each experiment.
2. Preparation of Standard Operating procedure for each equipment
3. Preparation of Laboratory Manual as per the guidelines specified by Combined Lab Team(CLT) headed by Principal/HOD/Dean/ in charge
4. Ensure Effective environmental conditions (temperature, humidity, storage and placement) in the laboratories by implementing proper housekeeping and cleaning of the equipments from dust, dirt etc.
5. Ensure Calibration of instruments/equipment (Only NABL accredited authorized laboratories provide calibration.
6. All the details of Calibration should be included in the format specified exclusively for calibration procedure.
7. Ensure proper implementation of all the documents, formats to be included in the lab manual.
8. Impart training for all the technicians working in labs about the importance of documentation, log sheets, operating procedure of the lab.
9. Incorporate Internal Lab audits for effective functioning of the laboratories. Audits may be once in a month or 3 months or at the end of the semester. The audit schedule will be decided by the Chairman and Principal of the CLT team.
10. Auditors should submit the detailed report of each lab duly signed to the Principal.
11. Each lab should maintain all the bills/invoices of each instrument or equipment in a separate file.
12. All the stock registers either consumable or non consumable should be updated whenever any purchases of consumables or equipment takes place.
13. All the safety precautions are properly displayed in front of each lab.

14. All the Lead experiments should be maintained separately in a record /record in a separate folder.
15. Based on Pre Assessment report submitted by auditor, corrective actions should be carried out by each lab in charge and that must be forwarded to concerned HOD and Principal.

# SUBJECTWISE LAB PLANNER

## ELECTRONIC DEVICES & CIRCUITS LAB

**CONTENTS:**

## 1. OBJECTIVES AND RELEVANCE

The main objective of the lab course is to gain practical hands on experience by exposing the students to understand the basic working principle of electronic devices and to specify various active and Passive electronic components and devices and identify the terminals and to draw the symbols for different electronic components. To investigate, test and verify characteristics of electronic devices, amplifiers and oscillators. Also helpful to learn operating principle and applications of electronic circuits and devices like amplifier, oscillator, switching circuits, wave shaping circuits and multivibrators.

## 2. SCOPE

Understanding of Electronic Devices and Circuits Lab has the scope to make the learner comfortable to work in the area of and also to implement various projects like monitoring and controlling applications. Industries involved in design and fabrication of devices, integrated circuits, embedded systems, electronic equipments etc have also provide large scale placements for engineers with this specialization. Installation and maintenance of electronic equipments used for health care in hospitals, equipments & systems for instrumentation and control in process industries automation systems of assembly line in production industries, etc are also handled by electronics engineers.

## 3. PREREQUISITES

The prerequisites for this lab are physics, General bonding theory and covalent bonding and basic knowledge in electrical circuit analysis including the fundamental theorems.

## 4. SYLLABUS-JNTUH

**List of Experiments:**

1. Forward & Reverse Bias Characteristics of PN Junction Diode.
2. Zener diode characteristics and Zener as voltage Regulator.
3. Input & Output Characteristics of Transistor in CB Configuration and h-parameter calculations.
4. Input & Output Characteristics of Transistor in CE Configuration and h-parameter calculations.
5. Half Wave Rectifier with & without filters.
6. Full Wave Rectifier with & without filters.
7. FET characteristics.
8. Design of Self-bias circuit.
9. Frequency Response of CC Amplifier.
10. Frequency Response of CE Amplifier.
11. Frequency Response of Common Source FET amplifier.

12. SCR characteristics.
13. UJT Characteristics

**EXPERIMENT NO. 1**

Forward & Reverse bias characteristics of PN junction diode.

**OBJECTIVE**

To perform PN Junction Diode Characteristics under forward and Reverse bias conditions and also calculating static & dynamic resistances.

**PREREQUISITES**

Knowledge of semiconductors, PN junction diode operation and ohms law.

**DESCRIPTION**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of PN Junction Diode characteristics.
d. Graphical determination of Static resistance and Dynamic resistance

**APPLICATIONS**

1. PN Junction Diode can be used in Rectifiers
2. Design of Clipper Circuits
3. Design of Clamper Circuits
4. used as Switch

**EXPERIMENT NO. 2**

Zener diode characteristics & Zener as voltage regulator

**OBJECTIVE**

To perform Zener Diode Characteristics under forward and Reverse bias Conditions and also calculating Forward bias Resistance.

**PREREQUISITES**

Priniciple of operation of zener diode and PN junction diode characteristics.

**DESCRIPTION**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of Zener Diode characteristics.
d. Graphical determination of Cut in Voltage and Break down Voltage

**APPLICATIONS**

1. Zener Diode Used as a regulating element in Voltage Regulators.
2. In various Protection circuits.
3. Zener Limiters.

**EXPERIMENT NO. 3**

Input & Output characteristics of Transistor in CB configuration and h-parameter calculations

**OBJECTIVE**

Determination of the transistor characteristics when it is operated in common base Configuration

**PREREQUISITES**

To know the working principle of Transistor and common base configuration characteristics and operation of small signal analysis of transistor, knowledge of H Parameters.

**DESCRIPTION**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of Transistor characteristics CB configuration.
d. Graphical determination of Common Base Input and Output Characteristics

**APPLICATIONS**

1. CB Configuration used as a input stage of multi stage Amplifier.
2. High Frequency Applications
3. Used as Amplifier

**EXPERIMENT NO. 4**

Input & Output characteristics of Transistor in CE configuration and h-parameter calculations

**OBJECTIVE**

Determination of the transistor characteristics when it is operated in common Emitter configuration.

**PREREQUISITES**

Working principle of Transistor and common emitter configuration characteristics, operation of small signal analysis of transistor, knowledge of h parameters

**DESCRIPTION**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of Transistor characteristics in CE configuration

d. Graphical determination of Common Emitter Input and Output Characteristic

**APPLICATIONS**

1. CE Configuration used in Audio Frequency Applications.
2. Coupling Device between various transistor stages.
3. Used as Amplifier

**EXPERIMENT NO. 5**

Half Wave Rectifier with & without filters.

**OBJECTIVE**

Study of Half Wave Rectifier with and without capacitance filters and determination of Regulation, Efficiency and Ripple factor.

**PREREQUISITES**

Basic Diode operation, Theory of Half Wave Rectifier and knowledge of the Capacitance Filter.

**DESCRIPTION**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of Half Wave Rectifier with & without filters.
d. Comparison of Practical and Theoretical calculations of Regulation, Efficiency and ripple factor.

**APPLICATIONS**

1. Used in Power Circuits to convert ac to dc.
2. Power Supply circuits.

**EXPERIMENT NO. 6**

Full Wave Rectifier with & without filters.

**OBJECTIVE**

Study of Full Wave Rectifier with and without capacitance filters and determination of regulation, Efficiency and Ripple factor.

**PREREQUISITES**

Basic Diode operation, Theory of Half wave and Full Wave Rectifiers and knowledge of the capacitance Filter.

**DESCRIPTION**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of Full Wave Rectifier with & without filters.

d. Comparison of Practical and Theoretical calculations of Regulation, Efficiency and ripple factor.

**APPLICATIONS**

1. Used in Power Circuits to convert ac to dc.
2. Power Supply circuits.

**EXPERIMENT NO. 7**

FET characteristics

**OBJECTIVE**

Determination of the drain and transfer characteristics for a given field effect Transistor and to find the drain resistance and Transconductance.

**PREREQUISITES**

Working principle of FET and its transfer characteristics

**DESCRIPTION**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of Field Effect Transistor.
d. Graphical determination of Drain and Transfer Characteristics of FET.

**APPLICATIONS**

1. Used as Voltage Variable Resistor in amplifiers and automatic gain controls
2. Electronic Voltmeters
3. Switching Applications

**EXPERIMENT NO. 8**

Design of Self-bias circuit

**OBJECTIVE**

To design and test a transistor self bias circuit and calculation of stability factor

**PREREQUISITES**

Knowledge of biasing, Operation of Self bias circuit.

**DESCRIPTION**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of self bias circuit by using thevenins equivalent circuit
d. Calculation of stability factor.

**APPLICATIONS**

1. Used as Amplifier.
2. Self bias circuit provides maximum thermal stability.

**EXPERIMENT NO. 9**

Frequency Response of CC Amplifier

**OBJECTIVE**

To design and test a common collector amplifier and find the following Parameters current gain, voltage gain, Bandwidth, Input and output impedances.

**PREREQUISITES**

Operation of small signal analysis of transistor, working principle of common collector Amplifier.

**DESCRIPTION**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of common collector amplifier and calculation of current gain, voltage gain, bandwidth, input and output impedances.
d. Graphical determination of CC amplifier characteristics.

**APPLICATIONS**

1. Used as amplifiers.
2. Impedance matching applications.
3. Emitter follower.

**EXPERIMENT NO. 10**

Frequency Response of CE Amplifier.

**OBJECTIVE**

To design and test a common collector amplifier and find the following Parameters current gain, voltage gain, Bandwidth, Input and output impedances.

**PREREQUISITES**

Operation of small signal analysis of transistor, working principle of common emitter amplifier.

**DESCRIPTION**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of common Emitter amplifier and calculation of current gain, Voltage gain, bandwidth, input and output impedances.

d. Graphical determination of CE amplifier characteristics.

**APPLICATIONS**

CE amplifier widely used for amplification purpose.

**EXPERIMENT NO. 11**

Frequency Response of Common Source FET Amplifier.

**OBJECTIVE**

To design and find the parameters of the single stage Common source Amplifier and calculate the Mid band gain, Bandwidth, Input and output impedances.

**PREREQUISITES**

Working principle of FET common source amplifier, small signal frequency model of FET.

**DESCRIPTION**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of FET CS amplifier and calculation of bandwidth, input and output impedance, mid band gain.
d. Graphical determination of FET CS amplifier Characteristics.

**APPLICATIONS**

CS amplifier provides good voltage amplification

**EXPERIMENT NO. 12**

SCR characteristics

**OBJECTIVE**

To study the SCR characteristics and also find the latching and holding current for given SCR.

**PREREQUISITES**

Working principle and characteristics of SCR.

**DESCRIPTION**

a. Introduction to experiment – 30 min
b. Connection of experiment and its verification.
c. Experimental determination of SCR characteristics and calculation of latching current and holding current.
d. Graphical determination of SCR Characteristics

**APPLICATIONS:**

1. Used as electronic switch.
2. Used as Rectifier. (ac voltage to dc voltage)

**EXPERIMENT NO. 13**

UJT characteristics

**OBJECTIVE**

Experimental determination of UJT characteristics.

**PREREQUISITES**

Working principle of UJT and its characteristics.

**DESCRIPTION**

a. Introduction to experiment – 30 min
b. Connection of experiment and its verification.
c. Experimental determination of UJT characteristics and calculation of intrinsic standoff ratio.
d. Graphical determination of UJT Characteristics

**APPLICATIONS**

1. Most popular application is UJT Relaxation Oscillator.
2. Timing Circuits.
3. Saw tooth wave Generators.
4. Triggering of SCR.

**5. LEAD EXPERIMENT**

**AIM:** To calculate the frequency of the RC phase shift oscillator & to measure the phase angles at different RC sections.

**APPARATUS:**

Transistor BC107

Resistors - 10KΩ, 8KΩ or 10KΩ, 22KΩ, 1.2KΩ, 100KΩ

Capacitors - 0.001µf, 10µF, 1µf

Regulated power Supply – (0-15V)

CRO

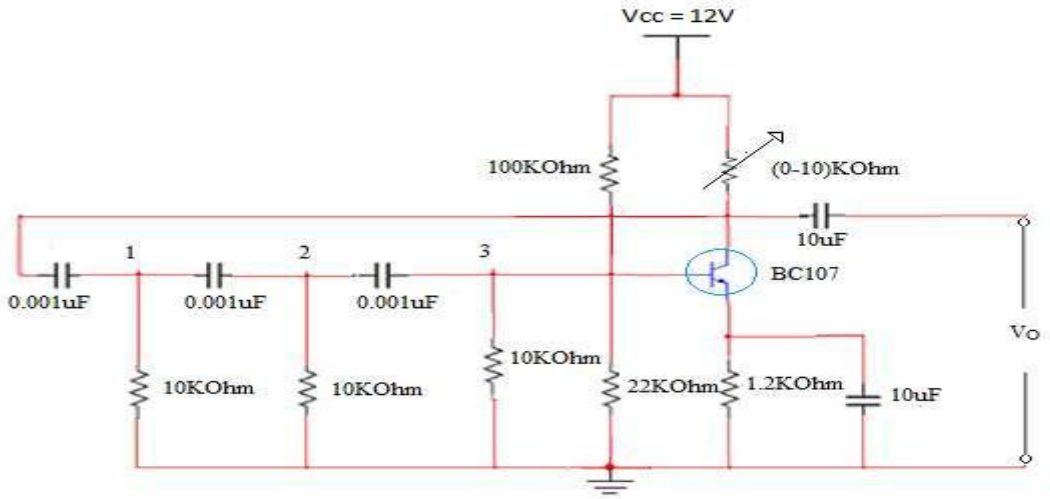
**THEORY:**

RC-Phase shift Oscillator has a CE amplifier followed by three sections of RC phase shift

feedback Networks the output of the last stage is return to the input of the amplifier. The values of R and C are chosen such that the phase shift of each RC section is 60º.Thus The RC ladder network produces a total phase shift of 180º between its input and output voltage for the given frequencies.

Since CE Amplifier produces 180 º phases shift the total phase shift from the base of the transistor around the circuit and back to the base will be exactly 360º or 0º. This satisfies the Barkhausen condition for sustaining oscillations and total loop gain of this circuit is greater than or equal to 1, this condition used to generate the sinusoidal oscillations. The frequency of oscillations of RC-Phase Shift Oscillator is,

**CIRCUIT DIAGRAM:**

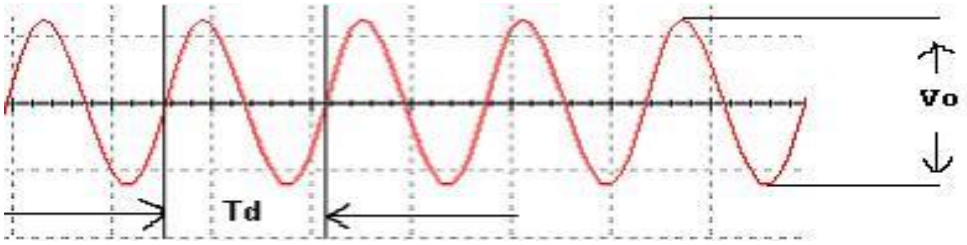



**PROCEDURE:**

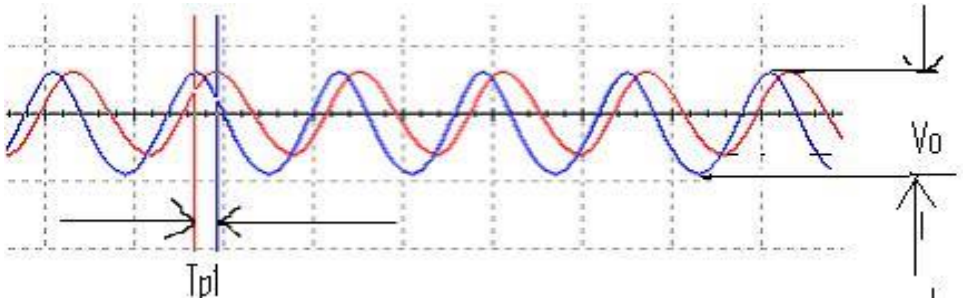
1. Make the connection as per the circuit diagram as shown above.
2. Observe the output signal and note down the output amplitude and time period ($T_d$).
3. Calculate the frequency of oscillations theoretically and verify it practically ($f=1/T_d$).
4. Calculate the phase shift at each RC section by measuring the time shifts ($T_p$) between the final waveform and the waveform at that section by using the below formula.

**MODEL WAVE FORMS:**

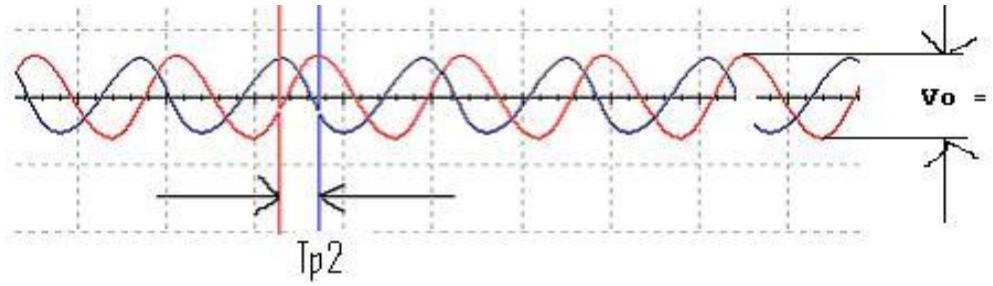
OUT PUT WAVEFORM:



OUT PUT WAVEFORM: $\theta = 60^0$



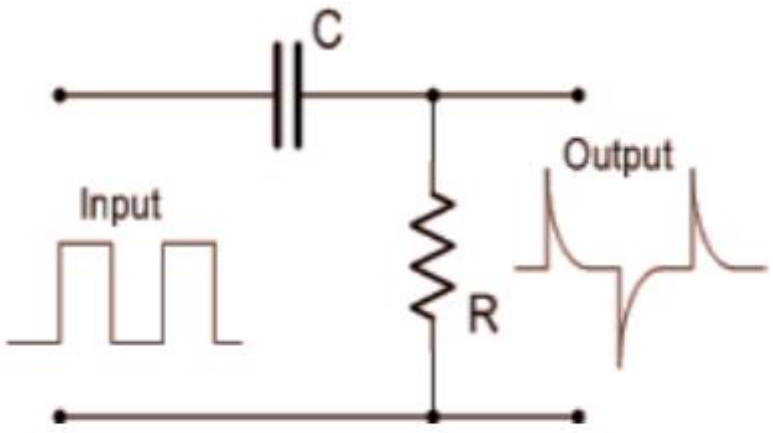

OUT PUT WAVEFORM: $\theta = 120^0$




**6. VIRTUAL LAB EXPERIMENT**

**RC as Differentiator:**

In an RC circuit if we take the voltage drop across R, and if we keep RC time constant is very short compared to the time period of the input waveform we will be differentiating the square wave




**Procedure:**

1. The voltage (V=12V) and the capacitance value is 1 μF.
2. The resistance value is 0.1 KΩ.

3. Click on 'ON' button to make the circuit on.
4. Select the Square Wave as input.
5. Click on 'switch on/off' button to close the switch, at high frequencies square wave input signal generates spike waveform output.
6. Now select Triangular wave as input and check the output,close the switch, at high frequencies Triangular wave input signal generates square waveform output.
7. Now select Sine wave as input and check the output,close the switch, at high frequencies Sinusoidal wave input signal generates Cosine waveform output.
8. Channel 1 shows the input wave, Channel 2 shows the output wave and Dual shows both the input and output wave.

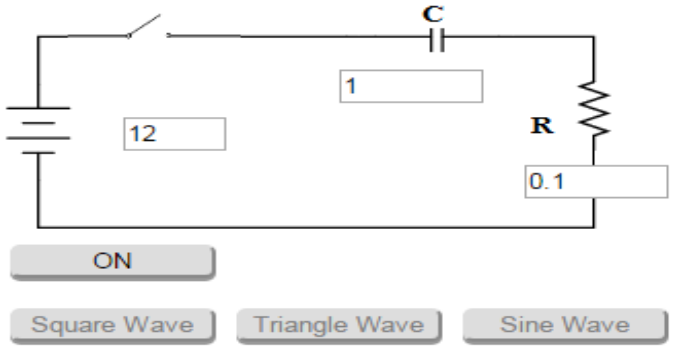
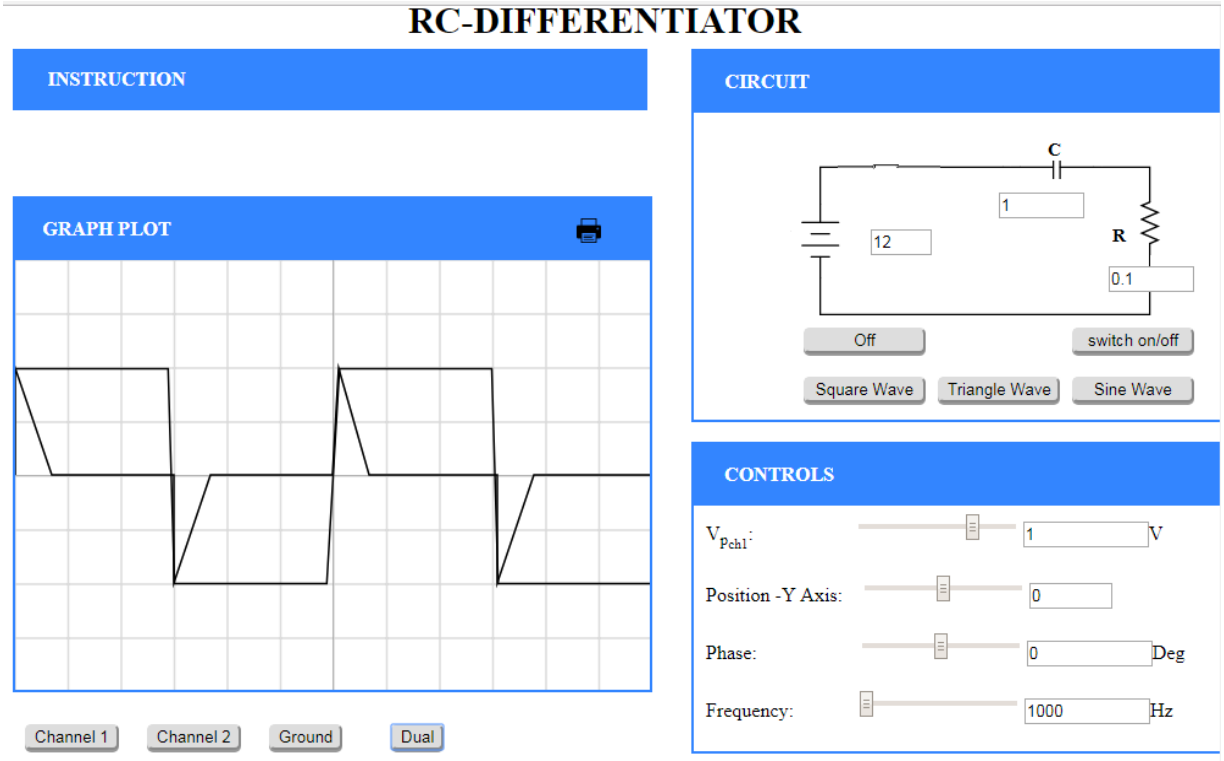
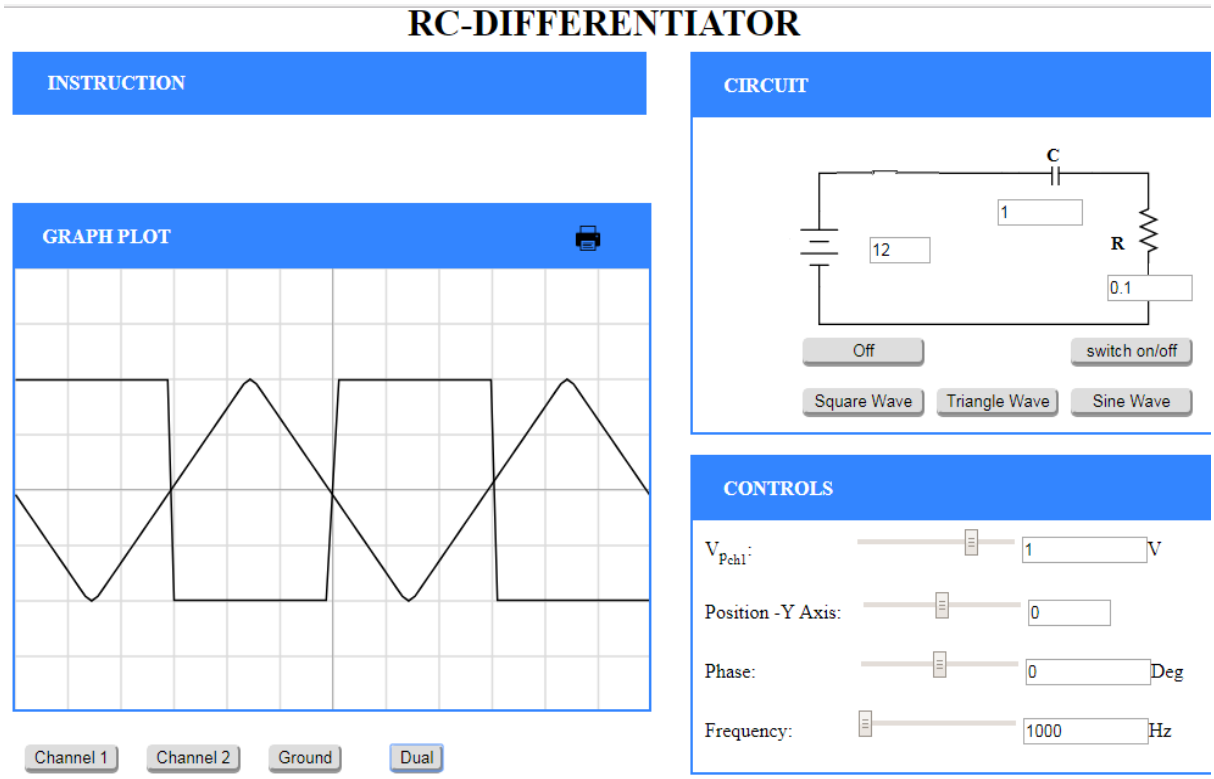
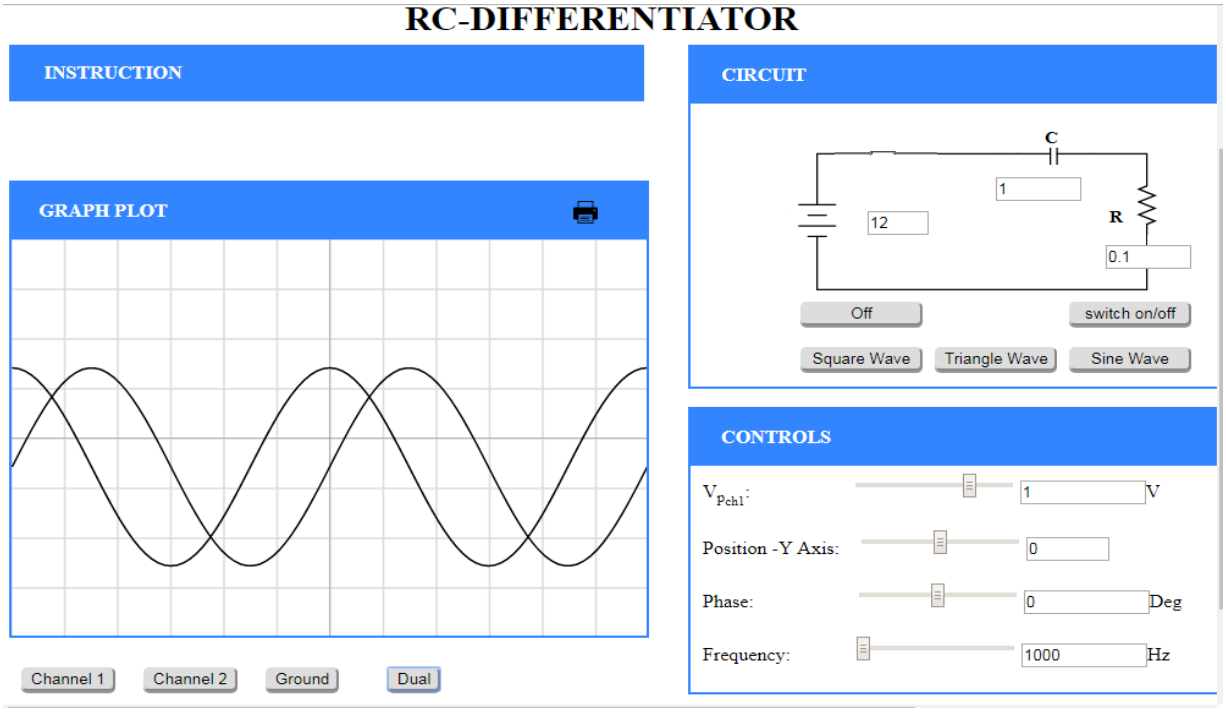



Figure 1




RC-DIFFERENTIATOR
INSTRUCTION
CIRCUIT
C
1
12
R
0.1
Off
switch on/off
Square Wave
Triangle Wave
Sine Wave
GRAPH PLOT
CONTROLS
$V_{Pch1}$:
1
V
Position -Y Axis:
0
Phase:
0
Deg
Frequency:
1000
Hz
Channel 1
Channel 2
Ground
Dual


RC-DIFFERENTIATOR
INSTRUCTION
CIRCUIT
C
1
12
R
0.1
Off
switch on/off
Square Wave
Triangle Wave
Sine Wave
GRAPH PLOT
CONTROLS
$V_{Pch1}$:
1
V
Position -Y Axis:
0
Phase:
0
Deg
Frequency:
1000
Hz
Channel 1
Channel 2
Ground
Dual

**Objective:**

1. Explain Ohm's Law
2. Measure and confirm Ohms Law

**Ohm's Law:**

1. The law states that the current through a conductor between two points is directly proportional to the voltage across the two points. Such a conductor is characterized by its 'Resistance' – R measured in Ohms.
2. V=I×RV=I×R
    - V is the Voltage in Volts across the conductor.
    - I is the current in Amperes through the conductor.
    - Voltage(V) is directly proportional to current i.e V=I×RV=I×R.
    - Resistance(R) in inversely proportional to current(I) i.e I=VRI=VR

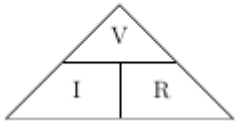



Figure 1: Ohm's Law triangle

**Procedure:**

Let us go through the experiment of confirming Ohms Law.

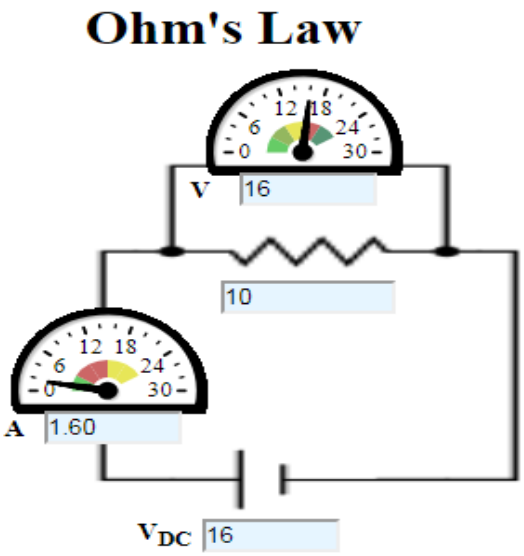
1. Set DC voltage(0-30 V).
2. Set the Resistance Value(1 Kohm - 100 Kohm) .
3. Voltmeter is placed parallel to resistor and ammeter series with resistor.
4. Now note the Voltmeter and Ammeter reading for DC voltage.
5. Increase the DC voltage by 2 factor and note Voltmeter and Ammeter Readings. Keep resistance value constant
6. Plot the V-I graph to verify Ohm's Law.
7. Repeat step 2 to 6 for another set of resistance value.
8. V versus I graph is a straight line.
9. Therefore from the graph we see that the resistance do adhere to Ohm's law. Thus resistance is said to be an Ohmic device.

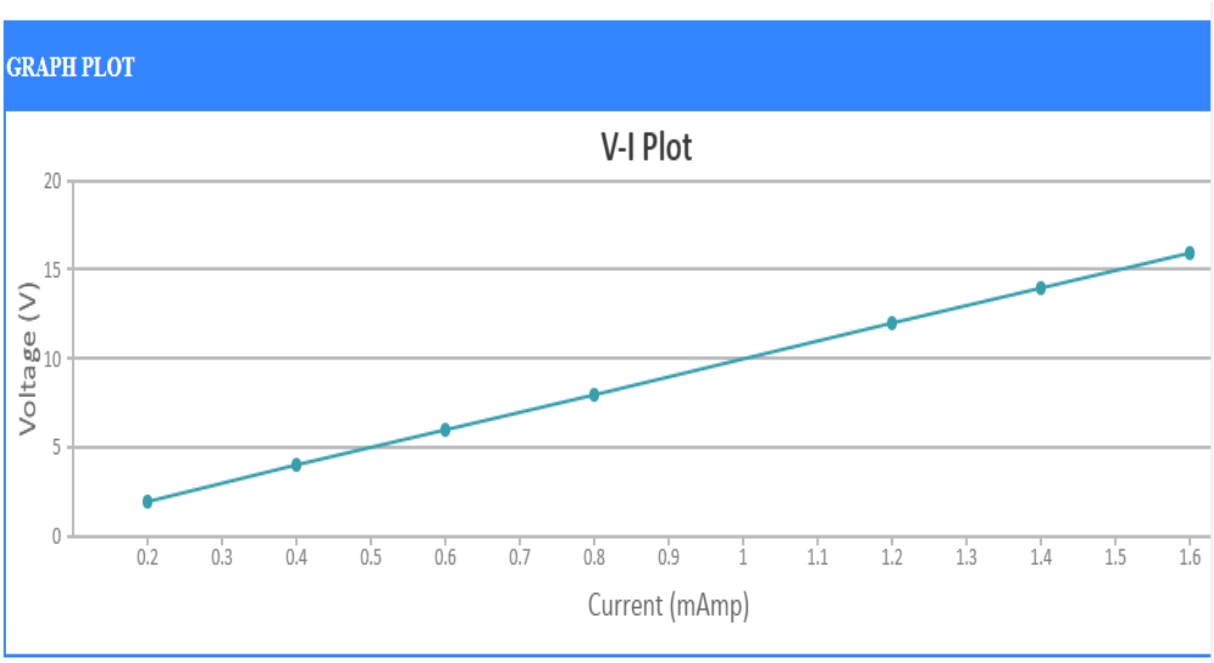
**INSTRUCTION**

**EXPERIMENTAL TABLE**

Resistance: 10 KΩ

| Serial No. | Voltage(Volt) V | Current(milliAmper mA |
|---|---|---|
| 1 | 2 | 0.200 |
| 2 | 4 | 0.400 |
| 3 | 6 | 0.600 |
| 4 | 8 | 0.800 |
| 5 | 12 | 1.20 |
| 6 | 14 | 1.40 |




## 7. SUGGESTED BOOKS

### TEXT BOOKS

1. Millman's Electronic Devices and Circuits – J. Millman, C.C.Halkias, and SatyabrataJit,
2Ed.,1998, TMH.
2. Electronic Devices and Circuits – Mohammad Rashid, Cengage Learing, 2013
3. Electronic Devices and Circuits – David A. Bell, 5 Ed, Oxford

**REFERENCE BOOKS:**

1. Integrated Electronics – J. Millman and Christos C. Halkias, 1991 Ed., 2008, TMH.
2. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, 9 Ed., 2006, PEI/PHI.
3. Electronic Devices and Circuits – B. P. Singh, Rekha Singh, Pearson, 2Ed, 2013.
4. Electronic Devices and Circuits - K. Lal Kishore, 2 Ed., 2005, BSP.
5. Electronic Devices and Circuits – Anil K. Maini, Varsha Agarwal, 1 Ed., 2009, Wiley India Pvt. Ltd.
6. Electronic Devices and Circuits – S.Salivahanan, N.Suresh Kumar, A.Vallavaraj, 2 Ed.

## 8. WEB SITES (USEFUL LINKS):

1. http://www.engineersgarage.com/electronic-circuits
2. http://archive.org/details/ElectronicDevicesCircuits
3. http://www.gobookee.net/electronic-devices-and-circuits/
4. http://engineeringppt.blogspot.in/electronic-devices-and-circuits.html
5. http://www.ieeeghn.org/wiki/index.php/IEEE_Electron_Devices_Society_History
6. http://www.documbase.com/electronic-devices-and-circuits-fundamentals.pdf
7. http://search.edaboard.com/electronic-books.html
8. http://www.general-files.com/files-d/download-electronic-devices-and-circuits/8/

## 9. EXPERT DETAILS

### INTERNATIONAL

1. J. Millman ph.d and C.C.Halkias ph.d
   Associate Professor of Electrical Engineering,
   Columbia University
2. Prof. Trevor J.Trarnton,
   Director of Center for Solid State Electronics Research,
   Arizona State University, Tempe, USA
   Email:khan.tarik@asu.edu

### NATIONAL

1. Dr. Balasubrmanyam S K – Professor,
   Department of Electronics Engineering IIT(BHU),Varanasi.
   Email:bala@bhu.ac.in
2. Dr.Banerjee Swapna,
   Professor in electronics &EC engineering,IIT Khragpur
   Email: swapna [at] ece.iitkgp.ernet.in

**REGIONAL**

1. P. John Paul
   Dean Academics in Gurunanak Engineering College, Hyderabad
2. K.Lal Kishore
   Professor of ECE and Director of Academic and Planning, JNTU Hyderabad

**10. (A) LAB SCHEDULE:** The lab schedule should be planned once in a week. The week wise Scheduled experiment should be completed.

**CYCLE 1 (For 30 students per session and 3 students per batch)**

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 | week-8 |
|---|---|---|---|---|---|---|---|---|
| B1, B2 | Demo | Exp.1 | Exp.2 | Exp.10 | Exp.9 | Exp.7 | Exp.8 | Lead1 |
| B3, B4 | Demo | Exp.2 | Exp.10 | Exp.9 | Exp.8 | Exp.1 | Exp.3 | Lead1 |
| B5, B6 | Demo | Exp.10 | Exp.9 | Exp.8 | Exp.1 | Exp.2 | Exp.7 | Lead1 |
| B7, B8 | Demo | Exp.9 | Exp.8 | Exp.1 | Exp.3 | Exp.10 | Exp.2 | Lead1 |
| B9, B10 | Demo | Exp.8 | Exp.1 | Exp.2 | Exp.7 | Exp.3 | Exp.10 | Lead1 |

**CYCLE 2(For 30 students per session and 3 students per batch)**

| **Batches** | **week-1** | **week-2** | **week-3** | **week-4** | **week-5** | **week-6** | week-7 | week-8 |
|---|---|---|---|---|---|---|---|---|
| B1, B2 | Exp.3 | Exp.4 | Exp.6 | Exp.11 | Exp.12 | Exp.5 | Hobby/lead2 | Test |
| B3, B4 | Exp.7 | Exp.6 | Exp.11 | Exp.12 | Exp.5 | Exp.4 | Hobby/lead2 | Test |
| B5, B6 | Exp.3 | Exp.11 | Exp.12 | Exp.5 | Exp.4 | Exp.6 | Hobby/lead2 | Test |
| B7, B8 | Exp.7 | Exp.12 | Exp.5 | Exp.4 | Exp.6 | Exp.11 | Hobby/lead2 | Test |
| B9, B10 | Exp.9 | Exp.5 | Exp.4 | Exp.6 | Exp.11 | Exp.12 | Hobby/lead2 | Test |

**(B) VIVA SCHEDULE:** The viva schedule should be planned prior starting to the lab experiment.

**ROUND** - 1

| **Batches** | **week-1** | **week-2** | **week-3** | **week-4** | **week-5** |
|---|---|---|---|---|---|
| B1,B2,B3 | viva | | | | |
| B1,B2,B3 | | Viva | | | |
| B1,B2,B3 | | | Viva | | |

| | | | | | |
|---|---|---|---|---|---|
| B1,B2,B3 | | | | Viva | |
| B1,B2,B3 | | | | | Viva |

**ROUND -** 2

| **Batches** | **week-1** | **week-2** | **week-3** | **week-4** | **week-5** |
|---|---|---|---|---|---|
| SG1 | viva | | | | |
| SG2 | | Viva | | | |
| SG3 | | | Viva | | |
| SG4 | | | | Viva | |
| SG5 | | | | | Viva |

*SG: Selected Group with a maximum of 6 or 12 students

**(C). SCHEME OF EVALUATION**

**LAB EXTERNAL**

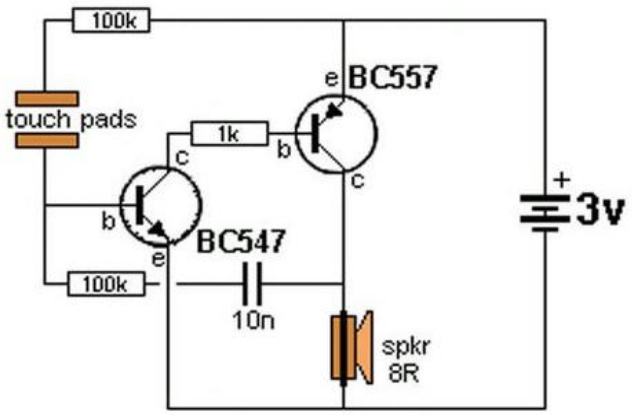
| S no. | **Write-up ( by Internal examiner)** | **Final evaluation (Internal Examiner)** | **Viva (External Examiner)** |
|---|---|---|---|
| 1 | Aim<br>Equipment needed<br>Circuit diagram<br>Procedure<br>Precautions<br>Tabular form<br>Expected graph | Based on observation, how the student is connecting the circuit, usage of equipment and typical readings<br>And based on correctness of the practical graph to the expected graph and results. | Based on understanding of Experiment and theoretical questions in the related subject. |
| | **Marks: 30** | **Marks: 30** | **Marks: 15** |
| **Total Marks:30+30+15=75 Marks** | | | |

**LAB INTERNAL**

| **Day to Day Evaluation ------ 15 Marks** | | | | | **Internal Exam ---10M Marks** | | |
|---|---|---|---|---|---|---|---|
| Uniform | Observation & Record | Performance of experiment | Result | Viva Voce | Write-up | Connections & Result | Viva Voce |
| **Marks:3** | **Marks:3** | **Marks:3** | **Marks:3** | **Marks:3** | **Marks:4** | **Marks:3** | **Marks: 3** |
| **Total Marks:15+10=25 Marks** | | | | | | | |

## 11. PROJECT/PRODUCT/PAPER BASED LEARNING

### LIE DETECTOR




This circuit detects the resistance between your fingers to produce an oscillation. The detection points will detect resistances as high as 300k and as the resistance decreases, the frequency increases. Separate the two touch pads and attach them to the back of each hand. As the subject feels nervous, he will sweat and change the frequency of the circuit. The photos show the circuit built on PC boards with separate touch pads.

## 12. MAPPING OF LAB WITH PROJECT/CONSULTANCY/R & D:

The Integrated Circuit Applications Lab course should be designed in such a way that it should meet the requirements of research and development as well as consultancy projects. Also the Proposals of Project/R&D/Consultancy are as follows:

Proposal 1: Project Design & Execution
Proposal 2: R& D Level Project Design & Execution
Proposal 3: Consultancy Task / Project Design & Development.

**Construction and technology of power semiconductor devices**

**Abstract**

Power electronic systems play a dominant role in making more efficient use of electric power in many appliances and offer a wide range of ways to control how electrical energy is transported and used. These systems enable automation and robotics, and play a very important role in traction by enabling the use of electric cars and trains. Effective energy delivery and conversion control, including power generation from renewable energy sources and smart energy distribution grids, will continue to grow in importance in future, due to the rising demand for energy.

Power semiconductor devices lie at the heart of this power electronics revolution. Their main task is to modulate the energy flow to suit the demands of the application. Advances in power semiconductor device technology have improved the size, weight, efficiency, reliability and cost of power electronic systems, and have enabled an ever-increasing number of circuit topologies and related applications. In recent times, energy-related social, economic and environmental concerns have been met by continuous progress in electrical power generation and control. The development trends in power devices are set to continue to enable future systems to satisfy performance expectations, especially in terms of power-handling capability and control

**PROPOSAL FOR PROJECT ACTIVITY:**

1. An exact paper from a National/International journal in this entitled area/subject/area (IEEE Format) AND/OR
2. An article/white paper from a magazine /journal/weekly/any periodical in the entitled subject AND/OR
3. An Advanced technology development/ proposal/article publication from any source of Information.

**PROPOSAL FOR PROJECT ACTIVITY:**

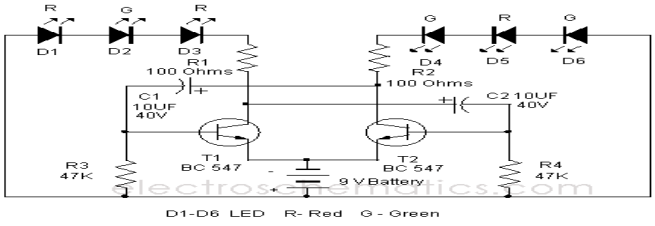
1. A Proposal of a hobby/mini/proto/general/model/proto type project with extended abstract, Block Diagram/Circuit/Flow diagram and clear references may be presented and executed.

**HOBBY PROJECT:**
**Title: 6 LED flasher**

**Description:**

It works on the principle of charging and discharging of capacitors C1 and C2. Current from the positive of battery flows through first set of LEDs D1-D3 to the collector of T1 through resistor R1. Resistor R1 limits current through the LEDs to protect them.
The current through R1 charges capacitor C2. It then discharges through the base of T2 and resistor R4. This gives base current to T2 and it conducts. As a result second set of LEDs D4-D6 lights as the current flows through T1.Capacitor C2 again charges and the cycle repeats. The same thing happens in the other side also. This gives alternate flashing of LEDs

**Circuit Diagram:**



**FUNDED/ UNFUNDED PROPOSALS:**

**OBJECTIVE:**

The proposals for AICTE grants like (SDPs, RPS and MODROBES etc) UGC grants, DST CPRI and other funding agencies by giving Title and abstract/objective OR Self Funded programme proposals may be submitted for Management approvals.

Proposal for Seminar Grant:

TITLE: Seminar on enhancement in FET's

OBJECTIVE: This seminar is intended to bring down the awareness among students and staff in order to study the various enhanced FET'S

## 13. GUIDELINES FOR SHADOW ENGINEERING (VIP) AND INDUSTRIAL VISITS (IIP – INNOVATIVE INDUSTRIAL LEARNING PROGRAM)

**OBJECTIVES OF SHADOW ENGINEERING:**

1. The program which uplifts the knowledge of the students related to laboratories.
2. To improve the industry-college interactions.
3. To create industry like environment for all the students in order to make future assignment.
4. This program leads to matrixing with the students.

**TABLE 1: INDUSTRIAL VISITS**

As of now no industrial visits is proposed.

| S. No | Type of industry | Nature of industry | Date of visit | No. of students participated | Year/branch | Remarks |
|---|---|---|---|---|---|---|
| 1 | | | | | | |

**TABLE 2: INDUSTRIAL TRAINING (Shadow Engg)**
**(Career Visit Approval)**

| S.no | Name of the Course | Nature of industry | Duration of Training | Authority | Date of Training/ Certificate No. | Remarks |
|---|---|---|---|---|---|---|
| 1 | | | | | | |

## 14. ACTIVITIES IN LIFT PROGRAMME:

### CALIBRATION/INSTALLATION AND TESTING:

Calibration: Aim of this concept is to check:

i. whether all the equipment is functioning correctly as per the standards
ii. To bring correctness in the errors of instrument or equipment.
iii. To rectify the errors if any

Installation: Aim of this concept is to make and maintain installation procedure for a New equipment or already existing equipment

Testing : Aim of this concept is to test the equipment after installation whether it Meets the existing standards.

The list of equipments (hardware/software):

Necessity of tools for development and testing.
Equipment to be calibrated.
Installation of supporting equipment if any.

### PROCEDURE FOR CALIBRATION:

Any Equipment or Instrument or Gauge or Machine can be calibrated as the standard guidelines mentioned under:

1. Identify the Equipment/Instrument/Gauge/Machine which is under defective or to be calibrated or correction for error
2. Identify the type of error and estimate its frequency of variation.
3. Check with Master Standards or equipment/instrument/machine which is working correctly and meeting our requirements.
4. Estimate the frequency of deviations from normal mode.
5. If the equipment is under warranty, then inform to concerned supplier or agency that will carry out calibration.
6. If the equipment is out of warranty then we can compare the deviations and set the error rectification.
7. Generally as per the procedure, the equipment or instruments can be calibrated by the agencies and issue calibration certificate which consists of date of calibration, calibration next due date and remarks as mentioned in the following format.
8. Record and keep all the calibration certificates in safe custody.

**After calibration the details of equipment should be submitted in following format.**

| S.no | Type of equipment | Certificate no | Certificate issued by | Date of calibration | Date of calibration due | Remarks |
|---|---|---|---|---|---|---|
| 1 | Cathode ray Oscilloscope | | SS Instruments, Kukatpally | | | |
| 2 | Trainer Kits | | SS Instruments, Kukatpally | | | |

**iv. Calibration, Testing and Installation details equipment wise are mentioned as follows:**

Case 1: Calibration of Equipment ---------- if any

Case 2: Installation of Equipment ---------- if any

Case 3: Testing of Equipment ---------- if any

Presently there is no new equipment is present for either testing or installations**.**

## 15. MAINTAINANCE AND TROUBLESHOOTING:

**Maintenance:**

Maintenance and trouble shooting of each equipment in a laboratory must follow the following guidelines:

Maintenance Schedules:

(1) Preventive Maintenance Schedules of lab will be decided by lab in charge along with concerned HOD. The details of schedule should be recorded in the following template of format.

| S.No. | Name of the Equipment | Date of Maintenance | Type of Activity | Remarks |
|---|---|---|---|---|
| 1 | Cathode ray Oscilloscope | 30/6/18 | Cleaning and Servicing | Working well |
| 2 | Power Supply's | 30/6/18 | Testing and Troubleshooting | Working OK |
| 4 | Multi-meters | 30/6/18 | Error Correction and Calibration | Working OK |

**(2)** Maintenance Reports duly signed by in charges as well as HODs and duly approved by Principal periodically.

**TROUBLE SHOOTING SCHEDULES:**

A proposal is to be made from each lab branch wise. The proposal should carry following details related to specific equipment in lab.

S.No., Equipment Name , Type of Problem (Too much Noise, Abnormal Sound, Corrupt Software, Anti Virus Problem, Missing of Display, CRT not working, Motor is not giving signal, Digital display is not working, Break of tools, Mis alignment of machine elements, PLC is not properly working), Expected Reasons ( Bearing failure, Improper alignment of machine centres, Missing of vibration pads etc)

Trouble shooting exercises should be properly recorded in a separate format as mentioned below:

| S.No. | Date of recording activity | Equipment Name | Type of Trouble | Remedial Activity | Remarks |
|---|---|---|---|---|---|
| | | | | | |

**16. ASSESSMENT AND ACCREDITATION PROCESDURE AS PER NABL**

Accreditation is the formal recognition, authorization and registration of a laboratory that has demonstrated its capability, competence and credibility to carry out the tasks. It provides the feedback to laboratories as to whether they are performing according to technical competence as per guidelines of NABL (National Accreditation Board for Testing and Calibration Laboratories)

The laboratory should carry out the following important tasks towards getting ready for accreditation from NABL.

1. Preparation of methodology in each experiment.
2. Preparation of Standard Operating procedure for each equipment
3. Preparation of Laboratory Manual as per the guidelines specified by Combined Lab Team(CLT) headed by Principal/HOD/Dean/ in charge
4. Ensure Effective environmental conditions (temperature, humidity, storage and placement) in the laboratories by implementing proper housekeeping and cleaning of the equipments from dust, dirt etc.
5. Ensure Calibration of instruments/equipment (Only NABL accredited authorized laboratories provide calibration.
6. All the details of Calibration should be included in the format specified exclusively for calibration procedure.
7. Ensure proper implementation of all the documents, formats to be included in the lab manual.
8. Impart training for all the technicians working in labs about the importance of documentation, log sheets, operating procedure of the lab.

9. Incorporate Internal Lab audits for effective functioning of the laboratories. Audits may be once in a month or 3 months or at the end of the semester. The audit schedule will be decided by the Chairman and Principal of the CLT team.
10. Auditors should submit the detailed report of each lab duly signed to the Principal.
11. Each lab should maintain all the bills/invoices of each instrument or equipment in a separate file.
12. All the stock registers either consumable or non consumable should be updated whenever any purchases of consumables or equipment takes place.
13. All the safety precautions are properly displayed in front of each lab.
14. All the Lead experiments should be maintained separately in a record /record in a separate folder.
15. Based on Pre Assessment report submitted by auditor, corrective actions should be carried out by each lab in charge and that must be forwarded to concerned HOD and Principal.

# SUBJECTWISE LAB PLANNER

## BASIC ELECTRICAL ENGINEERING LAB

**CONTENTS:**

## 1. OBJECTIVES AND RELEVANCE

This lab introduces the basic concepts of Electrical technology, which forms the core of the advanced concepts in the area of Electrical. The emphasis is laid on the basic circuit designing to the solutions of complex circuits, also concepts regarding working of electrical machines and measuring equipments is explored. In this lab we get the idea of flow of current and voltage in simple and complex circuits practically.

## 2. SCOPE

The scope of this lab is to provide a thorough knowledge of the flow of voltage and current in electrical networks and circuits. To find the different application of machines and network reduction techniques. It also provides the insight of the working and applications of electrical machines and measuring instruments.

## 3. PREREQUISITES

Before the start of the experiments one should have the knowledge of voltage, current, basic electrical components, relation between V and I w.r.t electrical components, difference between ac and dc.

## 4. SYLLABUS – JNTUH

### PART-A

| S. No | Name of the Experiment |
|---|---|
| 1 | 1. Verification of KVL and KCL. |
| 2 | 2. Serial and Parallel Resonance – Timing, Resonant frequency, Bandwidth and Q-factor determination for RLC network. |
| 3 | Time response of first order RC/RL network for periodic non-sinusoidal inputs – time constant and steady state error determination. |
| 4 | Two port network parameters – Z-Y Parameters, chain matrix and analytical verification. |
| 5 | Two port network parameters -ABCD and h parameters |
| 6 | Verification of Superposition and Reciprocity theorems. |
| 7 | Verification of maximum power transfer theorem. Verification on DC, verification on AC with Resistive and Reactive loads. |
| 8 | Experimental determination of Thevenin's and Norton's equivalent circuits and verification by direct test. |

**PART – B**

| S. No | Name of the Experiment |
|---|---|
| 1 | Magnetization characteristics of D.C. Shunt generator. Determination of critical field resistance. |
| 2 | Swinburne's Test on DC shunt machine (Predetermination of efficiency of a given DC Shunt machine working as motor and generator). |
| 3 | Brake test on DC shunt motor. Determination of performance characteristics. |
| 4 | OC & SC tests on Single-phase transformer (Predetermination of efficiency and regulation at given power factors and determination of equivalent circuit). |
| 5 | Brake test on 3-phase Induction motor (performance characteristics). |
| 6 | Regulation of alternator by synchronous impedance method. |
| 7 | Load test on single phase transform |

**Exp1: Verification of KVL and KCL**

**OBJECTIVE:**

This is the basic experiment to calculate the current flow and voltage across any elements.

**PREREQUISITES**

Basic circuit building, Understanding the meaning of voltage and current.

**DESCRIPTION**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications.

c. Experimental determination of voltage and current in the circuit.

d. Verifying the practical values by comparing with theoretical calculations.

**APPLICATIONS**

1. Current and Voltage values in closed loop circuits.

2. Describe the relation of values of currents that flow through a junction point, in an electrical circuit.

3. Describe the relation of values of voltages in an electrical circuit loop, in an electrical circuit.

4. Calculation of component values in a electric circuit.

**Exp2: Series and parallel resonance**

**OBJECTIVE:** TO obtain the resonance condition and calculations of resonant frequency, bandwidth and q-factor

**PREREQUISITES**

Basic circuit building, Understanding the meaning of voltage and current, Knowledge of quality factor, bandwidth and selectivity of resonant circuit, Q - factor of other types of resonant forms.

**DESCRIPTION**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications.
c. Experimental determination of voltage and current in the circuit.
d. Verifying the practical values by comparing with theoretical calculations

**APPLICATIONS**

1. Resonance can be employed to maintain AC circuit oscillations at a constant frequency.
2. Resonance can be exploited for its impedance properties: either dramatically increasing or decreasing impedance for certain frequencies.
3. Series resonance can be used as a "trap" if connected across a voltage source.
4. A parallel one can be used to tune a radio station.

**Exp2:SUPERPOSITION THEOREM & RECIPROCITY THEOREM:**

**OBJECTIVE: To verify Superposition theorem**

**PREREQUISITES**

Basic circuit building, Understanding the meaning of voltage and current, Knowledge

of nodal and mesh analysis.

**DESCRIPTION**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications.

c. Experimental determination of voltage and current in the circuit.

d. Verifying the practical values by comparing with theoretical calculations

**APPLICATIONS**

1. Current and Voltage values in closed loop circuits.

2. Describe the relation of values of currents that flow through a junction point, in an electrical circuit.

3. Describe the relation of values of voltages in an electrical circuit loop, in an electrical circuit.

4. Calculation of component values in a electric circuit.

**Exp: MAXIMUM POWER TRANSFER THEOREM**

**OBJECTIVE:**

To verify the maximum power transfer theorem for D.C network considering the resistive load.

**PREREQUISITES**

Basic circuit building, Understanding the meaning of power voltage and current

**DESCRIPTION**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications.

c. Experimental determination of voltage and current in the circuit.

d. Verifying the practical values by comparing with theoretical calculations

**APPLICATIONS**

1. Power values in closed loop circuits.

2. Describe the relation of values of currents that flow through a junction point, in an electrical circuit.

3. Describe the relation of values of voltages in an electrical circuit loop, in an electrical circuit.

4. Calculation of power values in a electric circuit.

**Exp: THEVENIN'S THEOREM**
**OBJECTIVE:**

To find the Thevenin's Voltage and Thevenin's Resistance for the given network.

**PREREQUISITES**

Basic circuit building, Understanding the meaning of power voltage and current

**DESCRIPTION**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications.

c. Experimental determination of voltage and current in the circuit.

d. Verifying the practical values by comparing with theoretical calculations

**APPLICATIONS**

1. Current and Voltage values in closed loop circuits.

2. Describe the relation of values of currents that flow through a junction point, in an electrical circuit.

3. Describe the relation of values of voltages in an electrical circuit loop, in an electrical circuit.

4. Calculation of component values in a electric circuit.

**Exp: NORTON'S THEOREM**

**OBJECTIVE**

To find the Norton’s Voltage and Norton’s Resistance for the given network.

**PREREQUISITES**

Basic circuit building, Understanding the meaning of power voltage and current

**DESCRIPTION**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications.

c. Experimental determination of voltage and current in the circuit.

d. Verifying the practical values by comparing with theoretical calculations

**APPLICATIONS**

1. Current and Voltage values in closed loop circuits.

2. Describe the relation of values of currents that flow through a junction point, in an electrical

circuit.

3. Describe the relation of values of voltages in an electrical circuit loop, in an electrical circuit.

4. Calculation of component values in a electric circuit.

**EXPERIMENT: Z and Y parameters**

**OBJECTIVE:**

T**o** verify Z and Y network parameters

**PREREQUISITES**

Basic circuit building, Understanding the meaning of power voltage and current

**DESCRIPTION**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications.

c. Experimental determination of voltage and current in the circuit.

d. Verifying the practical values by comparing with theoretical calculations

**APPLICATIONS**

1. Current and Voltage values in closed loop circuits.

2. Describe the relation of values of currents that flow through a junction point, in an electrical circuit.

3. Describe the relation of values of voltages in an electrical circuit loop, in an electrical circuit.

4. Calculation of component values in a electric circuit.

**EXPERIMENT: ABCD and h parameters**

**OBJECTIVE:**

To verify ABCD and h network parameters

**PREREQUISITES**

Basic circuit building, Understanding the meaning of power voltage and current

**DESCRIPTION**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications.

c. Experimental determination of voltage and current in the circuit.

d. Verifying the practical values by comparing with theoretical calculations

**APPLICATIONS**

1. Current and Voltage values in closed loop circuits.

2. Describe the relation of values of currents that flow through a junction point, in an electrical circuit.

3. Describe the relation of values of voltages in an electrical circuit loop, in an electrical circuit.

4. Calculation of component values in a electric circuit.

**EXPERIMENT: Swinburne's Test on DC shunt machine.**

**OBJECTIVE**

To conduct Swinburn's test on a D.C shunt machine and to predetermine the efficiency, when the machine is running as (i) Motor and (ii) Generator.

**PREREQUISITES**

Basic laws of electromagnetism, principle of operation, types of DC generators and Motors. Basic knowledge about 3-point starter, field and armature peed control of DC motor.

**DESCRIPTION**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Experimental determination of efficiency.

d. Graphical determination of efficiency and output.

**APPLICATIONS**

1. Design of DC generator

2. Design of excitation system for alternator.

3. Voltage stabilizer

4. Synchronous condenser.

**EXPERIMENT: Brake test on DC shunt motor.**

**OBJECTIVE**

To conduct the brake test on a given D.C shunt motor and to draw its performance curves.

**PREREQUISITES**

Basic laws of electromagnetism, principle of operation, types of DC generators and Motors. Basic knowledge about 3-point starter, field and armature peed control of DC motor

**DESCRIPTION**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Experimental determination of efficiency.

d. Graphical determination of efficiency, torque, speed and current.

**APPLICATIONS**

1. They are used for general lighting.
2. They are used to charge battery because they can be made to give constant output voltage.
3. They are used for giving the excitation to the alternators.
4. They are also used for small power supply.

**EXPERIMENT: Magnetization characteristics of D.C. Shunt generator**.

**OBJECTIVE**

To draw the OCC of a dc shunt generator and to obtain the critical resistance Rc of a dc shunt generator.

**PREREQUISITES**

Basic laws of electromagnetism, principle of operation, types of DC generators and Motors. Basic knowledge about 3-point starter, field and armature speed control of DC motor, OCC characteristics, procedure for drawing OCC characteristics.

**DESCRIPTION**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Experimental determination of magnetization characteristics.

d. Graphical determination of critical field resistance and critical speed

**APPLICATIONS**

1. Design of DC generator

2. Design of excitation system for alternator.

3. Voltage stabilizer

4. Synchronous condenser.

**EXPERIMENT: OC and SC tests on Single Phase Transformer**

**OBJECTIVE**

To conduct Open circuit and Short circuit tests on 1-phase transformer to pre-determine the efficiency, regulation and equivalent parameters.

**PREREQUISITES**

Principle of operation of transformer. Procedure for conducting OC and SC tests and theoretical knowledge on calculations of loses and efficiency.

**DESCRIPTION**

a. Introduction to experiment – 30 min

b. Connection of experiment and its verification.

c. Experimental determination of losses and efficiency.

**APPLICATIONS**

1. Determination of efficiency of transformer.

2. Determination of regulation of transformer

**BEE LAB COURSE OUTCOMES:**

| | |
|---|---|
| **C288.1** | Identify Circuit Currents and Voltages using Kirchhoff's Laws |
| **C288.2** | Apply Network Theorems to Identify Circuit Parameters |
| **C288.3** | Examine AC circuits to Solve for Resonance and Time Response |
| **C288.4** | Illustrate Various Parameters for Two-Port Network |
| **C288.5** | Determine Characteristics & Efficiency for Different Machines |
| **C288.6** | Measure Efficiency and Regulation of a Transformer |

## 5. LEAD EXPERIMENT:

**Speed control of DC shunt motor.**

### ABSTRACT

The main objective of this experiment is to control the speed of the DC shunt motor by two methods i.e., speed control by armature control method and speed control by flux control method.

**Advantages of flux control method:**

- This method is easy and convenient.
- As the shunt field is very small, the power loss in the shunt field is also small.

**Advantages of armature control method:**

- Speed changes with every change in load, because speed variations depend not only on controlling resistance but on load current also. This double dependence makes it impossible to keep the speed sensibly constant on rapidly changing loads.
- A large amount of power is wasted in the controller resistance. Loss of power is directly proportional to the reduction in speed. Hence, efficiency is decreased

### PREREQUISITES

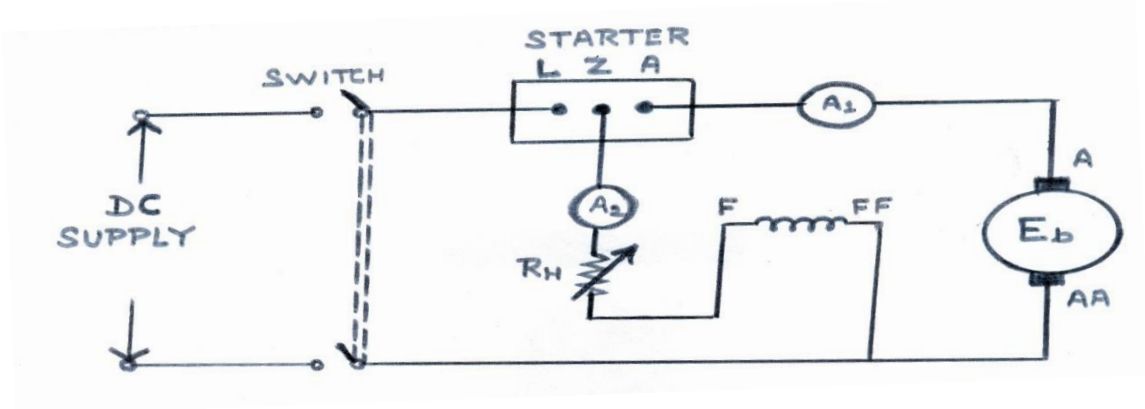
Basic knowledge about fundamentals of electrical machines, electromagnetic induction,

### DESCRIPTION

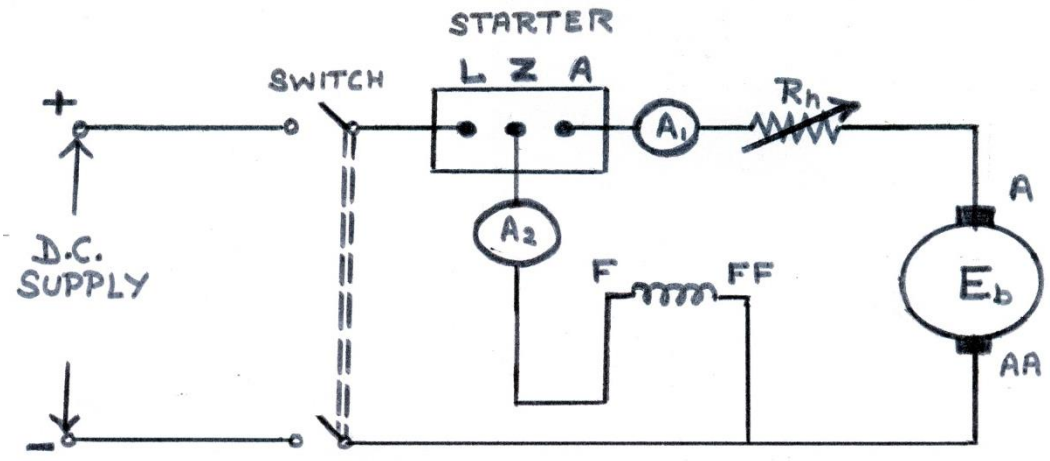
a. Introduction to the experiment.
b. Connection of experiment and its verifications
c. Experimental determination speed.

**Circuit Diagram:**

**Field Control Method**



**Armature Control Method**




## 6. VIRTUAL LAB EXPERIMENT

SIMULATION OF Nodal analysis for DC circuits

To obtain current and voltage in a DC circuit, the analysis is performed with the simple Load Bias Point.

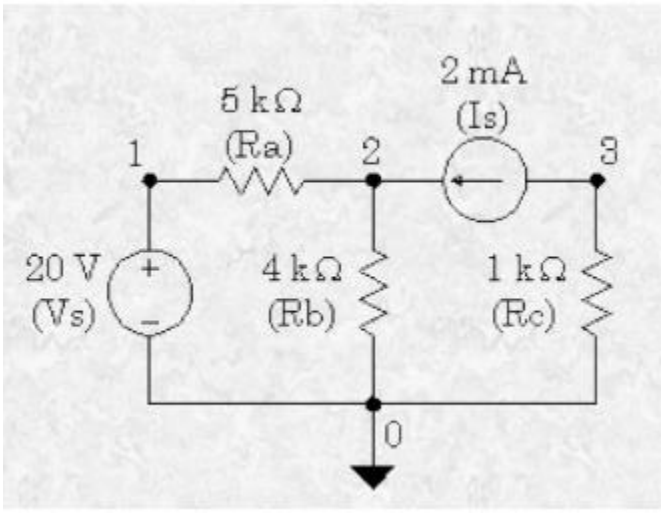
**PSPICE(**Personal Computer Simulation Program with Integrated Circuit Emphasis)

**INTRODUCTION:**

If any AC sources are present in the circuit, those sources are set to zero. All capacitors are replaced by the pen-circuit, and all inductors are replaced by short circuits. From the Analysis menu, choose Setup. The Analysis setup dialog box appears. Click the Enabled check box in the Bias Load Point option. To monitor a DC node voltage a VIEWPOINT is placed at that node. To obtain the DC current in a branch an IPROBE is placed in that branch. The reference direction of current for the circuit elements is from the first listed subscript to the second one. You may have to rotate the IPROBE from the Edit Menu (or use Ctrl R), so that the reading is in the assumed direction of current. To see the IPROBE direction of current, from the Analysis menu open the Examine Netlist file and check the order of element nodes.

**AIM:** To Simulate the DC Circuit for determining the all node voltages using PSPICE.
**SOFTWARE REQUIRED:** PSPICE – Personal Computer Simulated Program with Integrated Circuit Emphasis.

**Program:**




```
Vs    1    0    DC    20.0V
Ra    1    2    5.0k
Rb    2    0    4.0k
Rc    3    0    1.0k
Is    3    2    DC    2.0mA
.END
```

Output : NODE VOLTAGE NODE VOLTAGE NODE VOLTAGE NODE VOLTAGE ( 1) 20.0000 ( 2) 13.3330 ( 3) -2.0000 <== Results VOLTAGE SOURCE CURRENTS NAME CURRENT Vs -1.333E-03 <== Current entering node 1 of Vs TOTAL POWER DISSIPATION 2.67E-02 WATTS JOB CONCLUDED TOTAL JOB TIME .26

## 7. SUGGESTED BOOKS

1. Electrical Machines, I.J. Nagrath and D. P.Kothari, TMH publishers, 3rd publishers
2. Electro Mechanics-I(D.C.Machines), S. Kamakshaiah, Right Publishers
3. Electrical Machines, P.S Bhimbra, Khanna publications.
4. Fundamentals of Electronic Devices and Circuits, David A. Bell 5th Ed.
5. Electronic Devices and Circuits – K. Lal Kishore, 2ed. 2005, BSP
6. Millman's Electronic Devices and Circuits – J.Millman, C.C Halkias and Satyabrata , 2ed. 1998, TMH.

## 8 USEFUL WEBSITES

- http://www.svecw.edu.in/docs/eeeemlab.pdf
- http://iitg.vlab.co.in/?sub=61&brch=168&sim=913&cnt=1698
- www.vimicrosystems.com/vi/Web.../2_Electrical%20Machines%20lab
- http://www.slideshare.net/sai55chaitanya/electrical-machines-2-lab-manual
- http://www.sjcetpalai.ac.in/eee-labs
- http://www.squ.edu.om/Portals/67/Form&Downloads/ECCE4356_Lab_Manual.pdf
- http://www.nepindia.com/
- http://electricallabs.lakeheadu.ca/yeartwo/eng2258/man2258.pdf

## 9 EXPERTS DETAILS

### INTERNATIONAL

1. Mr. Clayton R Paul, BS, MS, PhD.
   Professor of Electrical and computer engineering,
   School of Engineering,
   Mercer University, Macom, Georgia-31207,
   www.faculty.mercer.edu.paul_cr.
2. Dr. Edward Wai-chau Lo, M.Phil.
   Honorary Associate Professor
   University of Hong Kong
   E-mail: eewclo@poly.edu.hk

### NATIONAL

1. Prof. D.P. Kothari
   Dy. Director (Admin.), IIT – Delhi
   Hauzkhas, New Delhi - 110016
   E-mail: dpko71@yahoo.com / dkothari@ces.iitd.ernet.in
2. Dr. Sivaji Chakravorti
   Professor, EEE Department
   Jadavpur University
   Kolkatta - 700032, India
   E-mail: sivaji@dvu.a.c.in / s_chakravorti@ieee.org

### REGIONAL

1. Prof. Dhanvanthri
   Head of EEE Department
   CVR Engineering College, Hyderabad
2. Prof. A.D. Rajkumar
   Electrical Engineering Dept.
   CVR Engineering College, Hyderaba

**10. (A) LAB SCHEDULE**

The lab schedule should be planned once in a week. The week wise scheduled experiment should be completed.

**CYCLE 1**

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 |
|---|---|---|---|---|---|---|---|
| B1 | Demo | Exp.1 | Exp.2 | Exp.10 | Exp.9 | Exp.8 | test |
| B2 | Demo | Exp.2 | Exp.10 | Exp.9 | Exp.8 | Exp.1 | test |
| B3 | Demo | Exp.10 | Exp.9 | Exp.8 | Exp.1 | Exp.2 | test |
| B4 | Demo | Exp.9 | Exp.8 | Exp.1 | Exp.2 | Exp.10 | test |
| B5 | Demo | Exp.8 | Exp.1 | Exp.2 | Exp.10 | Exp.9 | test |

**CYCLE 2**

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 |
|---|---|---|---|---|---|---|---|
| B1 | Exp.3 | Exp.4 | Exp.6 | Exp.11 | Exp.12 | Exp.5 | test |
| B2 | Exp.7 | Exp.6 | Exp.11 | Exp.12 | Exp.5 | Exp.4 | test |
| B3 | Exp.3 | Exp.11 | Exp.12 | Exp.5 | Exp.4 | Exp.6 | test |
| B4 | Exp.10 | Exp.12 | Exp.5 | Exp.4 | Exp.6 | Exp.11 | test |
| B5 | Exp.9 | Exp.5 | Exp.4 | Exp.6 | Exp.11 | Exp.12 | test |

**(B) VIVA SCHEDULE:**

The viva schedule should be planned prior starting to the lab experiment.

**ROUND –** 1

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 |
|---|---|---|---|---|---|
| B1,B2,B3 | viva | | | | |
| B4,B5,B6 | | viva | | | |
| B1,B2,B3 | | | viva | | |
| B4,B5,B6 | | | | viva | |
| B1 to B6 | | | | | viva |

**ROUND -** 2

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 |
|---|---|---|---|---|---|
| SG1 | viva | | | | |
| SG2 | | viva | | | |

| | | | | | |
|---|---|---|---|---|---|
| SG3 | | | viva | | |
| SG4 | | | | viva | |
| SG5 | | | | | viva |

*SG: Selected Group with a maximum of 6 or 12 students

**(C). SCHEME OF EVALUATION**

**LAB EXTERNAL**

| S no. | **Write-up ( by Internal examiner)** | **Final evaluation (Internal Examiner)** | **Viva (External Examiner)** |
|---|---|---|---|
| 1 | Aim<br>Equipment needed<br>Circuit diagram<br>Procedure<br>Precautions<br>Tabular form<br>Expected graph | Based on observation, how the student is connecting the circuit, usage of equipment and typical readings<br>And based on correctness of the practical graph to the expected graph and results. | Based on understanding of Experiment and theoretical questions in the related subject. |
| | **Marks: 30** | **Marks: 30** | **Marks: 15** |
| **Total Marks:30+30+15=75 Marks** | | | |

**LAB INTERNAL**

| **Day to Day Evaluation ------ 15 Marks** | | | | | **Internal Exam ---10M Marks** | | |
|---|---|---|---|---|---|---|---|
| Uniform | Observation & Record | Performance of experiment | Result | Viva Voce | Write-up | Connections & Result | Viva Voce |
| **Marks:3** | **Marks:3** | **Marks:3** | **Marks:3** | **Marks:3** | **Marks:4** | **Marks:3** | **Marks: 3** |
| **Total Marks:15+10=25 Marks** | | | | | | | |

## 11. PROJECT/PRODUCT/PAPER BASED LEARNING

### ABSTRACT

This project will display the configuration, development, advancement, control and assessment of an automatic switching speed electric fan. This further venture of a smart electric fans than before that utilizing "clever innovation". The microcontroller base programmed fan framework introduced in this task is obliged to satisfy the necessity of advances "tomorrow will be better than today". The electric fan naturally switches the speed as indicated by the environment temperature changes. Generally, electronic gadgets create enough heat due to internal loss. There is a necessity to decrease heat to so that electronics devices won't lose their characteristic. The heat can be minimized in various methods. One of the method is temperature dependent dc fan implementing microcontroller. When environment temperature sensed by the sensor crosses the threshold value fan is switched on and temperature is reduced. The fan will remain on till the temperature reduces below the threshold value. This general idea is used in this project.

### INTRODUCTION

The objectives of this project are to:- Enable the electric fan to consequently change the rate level as indicated by temperature changes. Develop an automatic fan framework that can change the speed level because of the environment temperature changes.

Literature Survey - The advancements done in the topic around the globe Project Background Infrequently electric fan utilization is squandering force as a result of human demeanor. Human additionally generally requests something that effortlessly to be utilized without squandering vitality. To minimize or diminish the force use, this venture added to a programmed framework where pace is controlled by the room temperature. The microcontroller base programmed fan framework displayed in this venture is obliged to satisfy the necessity of advances "tomorrow will be more exceptional than today". The electric fan naturally switches the pace as per the earth temperature changes. This electric fan framework contains mix of sensor, controller, driver and engine with incorporation of installed controlled programming. 2 Problem Statement Most human feels the badly designed about changing the fan rate level physically when the room temperature changes. Along these lines, the programmed fan framework that consequently changes the velocity level as indicated by temperature changes is prescribed to be fabricated for tackling this issue

### COMPONENTS

1)Transformer
2)Diodes (IN4007)
3)Resistors
4)Capacitors
5)Led
6)Relay
7)DC Motor
8)NTC
9)Potentiometer
10)Transistor
11)Voltage regulator

12)IC CA3140EZ

## COMPONENT DESCRIPTION

### 1)Transformer:

Electrical power transformer is a static device which transforms electrical energy from one circuit to another without any direct electrical connection and with the help of mutual induction between two windings. It transforms power from one circuit to another without changing its frequency but may be in different voltage level. This is a very short and simple definition of transformer, as we will go through this portion of tutorial related to electrical power transformer

### 2)Diode:

The most common function of a *diode* is to allow an electric current to pass in one direction (called the *diode's* forward direction), while blocking current in the opposite direction (the reverse direction). Thus, the *diode* can be viewed as an electronic version of a check valve.

### 3)Resistor:

In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses. High-power resistors that can dissipate many watts of electrical power as heat may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity

### 4)Capacitor:

capacitor is a passive two-terminal electrical component that stores electrical energy in an electric field.[1] The effect of a capacitor is known as capacitance. While capacitance exists between any two electrical conductors of a circuit in sufficiently close proximity, a capacitor is specifically designed to provide and enhance this effect for a variety of practical applications by consideration of size, shape, and positioning of closely spaced conductors, and the intervening dielectric material. A capacitor was therefore historically first known as an electric condenser

### 5)LED:

A light-emitting diode (LED) is a two-lead semiconductor light source. It is a p–n junction diode that emits light when activated.[5]When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor. LEDs are typically small (less than 1 $mm^2$) and integrated optical components may be used to shape the radiation pattern.[6]

### 6)Relay:

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are

used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

**7) DC MOTOR:**

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications

**8)NTC:**

NTC thermistors are resistors with a negative temperature coefficient, which means that the resistance decreases with increasing temperature. They are primarily used as resistive temperature sensors and current-limiting devices

**9)Potentiometer:**

A potentiometer is a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage dividA potentiometer is an instrument for measuring voltage by comparison of an unknown voltage with a known reference voltage. If a sensitive indicating instrumenter. If only two terminals are used potentiometer is an instrument for measuring voltage by comparison of an unknown voltage with a known reference voltage. If a sensitive indicating instrument

**10)Transistor:**

A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power. It is composed of semiconductor material usually with at least three terminals for connection to an external circuit.

**11)Voltage regulator:**

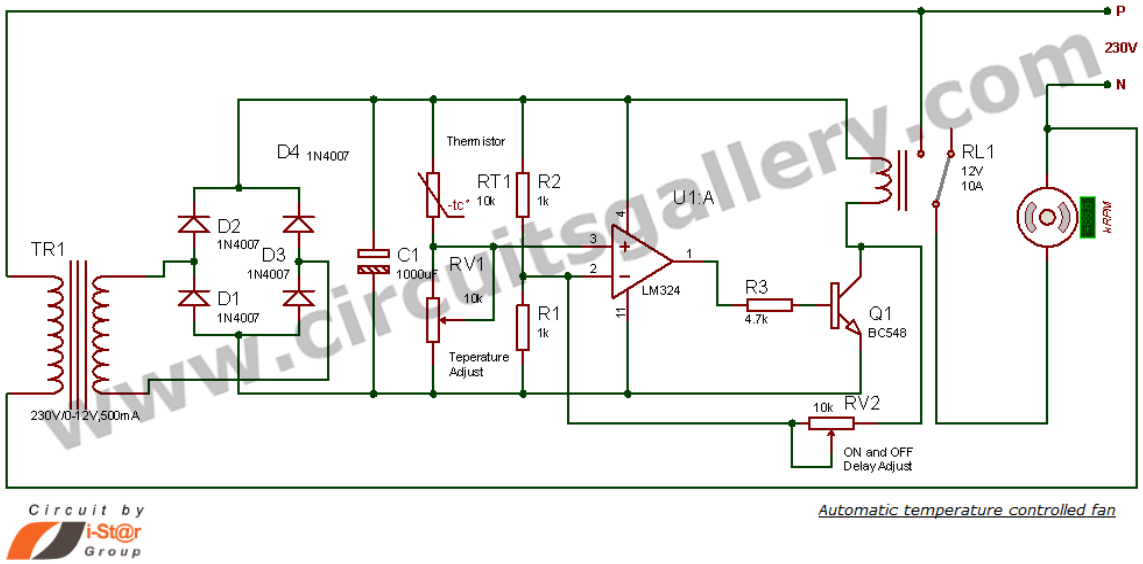
A voltage regulator is designed to automatically maintain a constant voltage level. A voltage regulator may use a simple feed-forwarddesign or may include negative feedback. It may use an electromechanical mechanism, or electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages.

Electronic voltage regulators are found in devices such as computer power supplies where they stabilize the DC voltages used by the processor and other elements. In automobile alternators and central power station generator plants, voltage regulators control the output of the plant. In an electric power distribution system, voltage regulators may be installed at a substation or along distribution lines so that all customers receive steady voltage independent of how much power is drawn from the line.

**12)Integrated Circuit:**

The CA3140A and CA3140 BiMOS operational amplifiers feature gate protected MOSFET (PMOS) transistors in the input circuit to provide very high input impedance, very low input current, and high speed performance. The CA3140A and CA3140 operate at supply voltage from 4V to 36V (either single or dual supply). These operational amplifiers are internally phase compensated to achieve stable operation in unity gain follower operation, and additionally, have access terminal for a supplementary external capacitor if additional frequency roll-off is desired. Terminals are also provided for use in applications requiring input offset voltage nulling. The use of PMOS field effect transistors in the input stage results in common mode input voltage capability down to 0.5V below the negative supply terminal, an important attribute for single supply applications. The output stage uses bipolar transistors and includes built-in protection against damage from load terminal short circuiting to either supply rail or to ground.FN957 The CA3140A and CA3140 are intended for operation at supply voltages up to 36V (卤18V).

**CIRCUIT DIAGRAM**






**WORKING:**

The basic working principle of temperature controlled DC fan is based on the working principle of the thermistor. The thermistor is a component which changes its resistance as its

temperature changes. There are two types of thermistor available which are NTC i.e. negative temperature coefficient and other is PTC which is positive temperature coefficient.

In temperature controlled DC fan, we have used an NTC type thermistor. It is called NTC because its resistance increases when its temperature decreases and vice verse. Similarly, in PTC, its resistance increases when temperature increases and vice verse.

Op amp IC741 is used as a voltage comparator which compares the voltage between its two inputs i.e. inverting and non-inverting terminals. Pin number 2 is inverting terminal which is connected to the potentiometer and pin number 3 is a non inverting terminal which is connected in between thermistor and R1 which makes a voltage divider circuit. Thus the output of op amp is responsible for the speed of the fan.

When the temperature of surrounding increases, the temperature of thermistor also increases which causes its resistance to decrease, therefore voltage divider circuit causes more voltage across pin number 3. Thus the output voltage increases causing the speed of the fan to increase.

**ADVANTAGES**

1)It is very economical and easy to handle by the user.
2)Speed varies automatically so that it controls the speed without using it manually.
3)It is help full to disable people.
4)It is very easy to install in offices houses etc,
5)Save energy by slowing its speed in low temperature.

**DISADVANTAGES**

1)IC is the heart of the circuit if it is damages the whole system will be interrupted
2)Speed control is independent individual preference.

**APPLICATIONS**

Typical application include automotive, telecom laptop equipments many other portable and non-portable. Sometimes you could find fans used in conjunction with a heat sink to increase overall airflow.

## 12. MAPPING OF LAB WITH PROJECT/CONSULTANCY/R & D

The Machine tools lab course should be designed in such a way that it should meet the requirements of research and development as well as consultancy projects. Also the Proposals of Project/R&D/Consultancy are as follows:

Proposal 1: Project Design & Execution

Proposal 2: R& D Level Project Design & Execution

Proposal 3: Consultancy Task / Project Design & Development

## PROPOSAL FOR R & D ACTIVITY:

1. An exact paper from a National/International journal in this entitled area/subject/area (IEEE Format) AND/OR

- An article/white paper from a magazine /journal/weekly/any periodical in the entitled Subject AND/OR
- An Advanced technology development/ proposal/article publication from any source of information.

**EXACT PAPER FROM A NATIONAL/INTERNATIONAL JOURNAL**

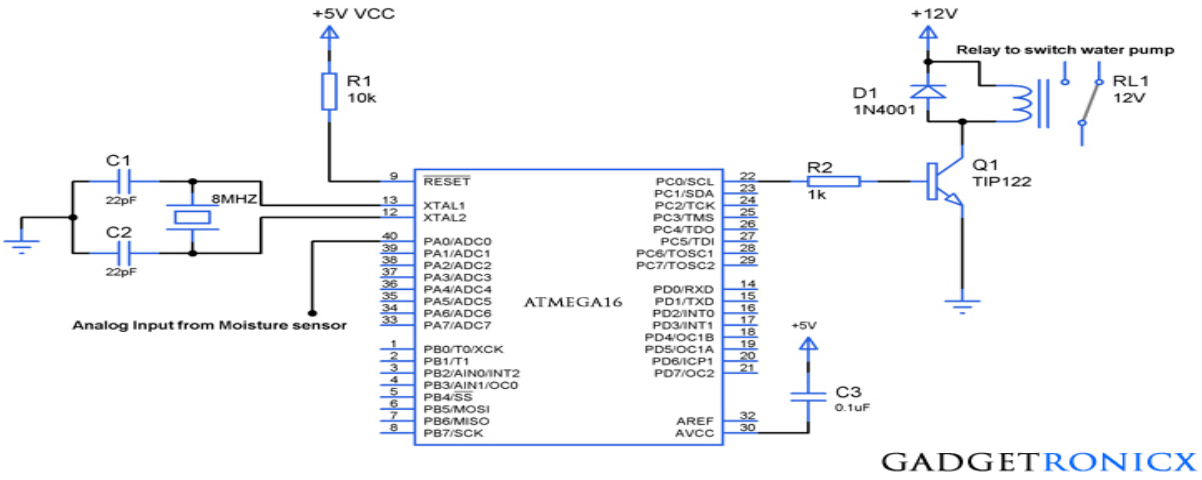
**Title: Hybrid Electric car**

**PROPOSAL FOR PROJECT ACTIVITY**

A Proposal of a hobby/mini/proto/general/model/proto type project with extended abstract, Block 9oui8ytrngf Diagram/Circuit/Flow diagram and clear references may be presented and executed.

**ABSTRACT ON HOBBY PROJECT**

**AUTOMATIC IRRIGATION SYSTEM**




## INTRODUCTION AND CONSTRUCTION:-

- The aim of the project is to control a motor based on the moisture in the soil. The design of the circuit is as follows. ATMEGA16 is the main processing IC.
- A 8 MHz crystal oscillator is connected across the XTAL1 and XTAL2 (PIN 12 and 13). The crystal is connected with two 22pF capacitors.
- The Master Clear pins is normally connected to Vcc via a pull-up resistor. A bypass button is connected to ground. This button is used to reset the microcontroller.
- The output of the soil moisture sensor is given to PA0 (Pin 40) of the microcontroller

- 
- In order to drive the relay which is connected to the motor, a transistor is used. The input to the transistor is given from PC0 (Pin 22) of microcontroller.

- One terminal of the relay coil is supplied with a 12 V DC. The other end of the coil is connected to the collector of the transistor. The contacts of the relay are given to the motor and AC supply.
- An LED is connected between the DC supply and the collector and glows only when the motor is running.

## PROPOSAL FOR CONSULTANCY

**OBJECTIVE:** A programme/machine/product of utility may be proposed to develop for in house usage/ Industrial requirements may be useful for any outside agency that can be marketable in order to generate revenue through consultancy.

## TESTING OF 2KVA 220V/220V 1-PHASE TRANSFORMER FOR EFFICIENCY

The physical basis of the transformer is mutual induction between two circuits linked by a common magnetic field. Transformer is required to pass electrical energy from one circuit to another, via the medium of the pulsating magnetic field, as efficiently and economically as possible. This could be achieved using either iron or steel which serves as a good permeable path for the mutual magnetic flux. An elementary linked circuit is shown in Fig.1. The principle of operation of this circuit can be explained as follows:

Let an alternating voltage v1 be applied to a primary coil of N1 turns linking a suitable iron core. A current flows in the coil, establishing a flux Øp in the core. This flux induces an emf e1 in the coil to counterbalance the applied voltage v1. This e.m.f. is

$$e_1 = N_1 \frac{d\phi_p}{dt}.$$

Assuming sinusoidal time variation of the flux, let $\phi_p = \Phi_m \sin \omega t$. Then,

$$e_1 = N_1 \omega \Phi_m \cos \omega t, \quad \text{where} \quad \omega = 2\pi F$$

$$E_1 = 4.44 F N_1 \Phi_m$$

$$E_2 = 4.44 F N_2 \Phi'_m$$

**From transformation ratio**

$$\frac{e_1}{e_2} = \frac{E_2}{E_1} = \frac{N_2}{N_1}$$

**FUNDED/UNFUNDED PROPOSALS (if any):**
**OBJECTIVE:**

The proposals for AICTE grants like (SDPs, RPS and MODROBES etc) UGC grants, DST CPRI and other funding agencies by giving Title and abstract/objective OR Self Funded program proposals may be submitted for Management approvals

Not applicable.

**13. GUIDELINES FOR SHADOW ENGINEERING (VIP)**

**INDUSTRIAL VISITS (IIP – INNOVATIVE INDUSTRIAL LEARNING PROGRAM):**

**OBJECTIVES OF SHADOW ENGINEERING:**

1. The program which uplifts the knowledge of the students related to laboratories.
2. To improve the industry-college interactions.
3. To create industry like environment for all the students in order to make future Assignment.
4. This program leads to matrixing with the students.

**PROPOSALS (WEEK WISE INDUSTRIAL VISITS)(IN HOUSE OR OUTSIDE VISIT)/TRAINING PROGRAMMES:**

**TABLE 1 : INDUSTRIAL VISITS**

| S.no | Type of industry | Nature of industry | Date of visit | No. of students participated | Year/ branch | remark |
|---|---|---|---|---|---|---|
| | | | | | | |

**TABLE 2: INDUSTRIAL TRAINING (Shadow Engg)**
**(Career Visit Approval)**

| S.no | Name of the Course | Nature of industry | Duration of Training | Authority | Date of Training/Certificate No. | remarks |
|---|---|---|---|---|---|---|
| | | | | | | |

**14. ACTIVITIES IN LIFT PROGRAMME:**

**CALIBRATION/INSTALLATION AND TESTING:**

**Calibration**: Aim of this concept is to check

- whether all the equipment is functioning correctly as per the standards

ii. To bring correctness in the errors of instrument or equipment.

iii. To rectify the errors if any

**Installation**: Aim of this concept is to make and maintain installation procedure for a new equipment or already existing equipment

**Testing**: Aim of this concept is to test the equipment after installation whether it Meets the existing standards.

The list of equipments (hardware/software):

Necessity of tools for development and testing:

Equipment to be calibrated:

Installation of supporting equipment if any:

**PROCEDURE FOR CALIBRATION:**

Any Equipment or Instrument or Gauge or Machine can be calibrated as the standard guidelines mentioned under:

1. Identify the Equipment/Instrument/Gauge/Machine which is under defective or to be calibrated or correction for error
2. Identify the type of error and estimate its frequency of variation.
3. Check with Master Standards or equipment/instrument/machine which is working correctly and meeting our requirements.
4. Estimate the frequency of deviations from normal mode.
5. If the equipment is under warranty, then inform to concerned supplier or agency who will carry out calibration.
6. If the equipment is out of warranty then we can compare the deviations and set the error rectification.
7. Generally as per the procedure, the equipment or instruments can be calibrated by the agencies and issue calibration certificate which consists of date of calibration, calibration next due date and remarks as mentioned in the following format.
8. Record and keep all the calibration certificates in safe custody.

After calibration the details of equipment should be submitted in following format.

| S.No | Type of equipment | Certificate no | Certificate issued by | Date of calibration | Date of calibration due | Remarks |
|---|---|---|---|---|---|---|
| 1 | FT-3254 DC Ammeter (0-20)mA Digital type | 316 | Future Tech instruments P LTD | | | |
| 2 | FT-3264 Digital AC Ammeter (0-100)mA | 316 | Future Tech instruments P LTD | | | |
| 3 | FT-3213 DC Voltmeter (0-20)v Digital type | 316 | Future Tech instruments P LTD | | | |
| 4 | FT-3254 DC Ammeter (0-20)mA Digital type | 316 | Future Tech instruments P LTD | | | |
| 5 | FT-3264 Digital AC Ammeter (0-100)mA | 316 | Future Tech instruments P LTD | | | |

iv. Calibration,Testing and Installation details equipment wise are mentioned as follows:

Case 1: Calibration of Equipment ---------- if any

Case 2: Installation of Equipment ---------- if any

Case 3: Testing of Equipment ---------- if any

Presently there is no new equipment is present for either testing or installations.

**15.MAINTAINANCE AND TROUBLESHOOTING:**

**MAINTENANCE:**

Maintenance and trouble shooting of each equipment in a laboratory must follow the following guidelines:

Maintenance Schedules:

- Preventive Maintenance Schedules of lab will be decided by lab in charge along with concerned HOD. The details of schedule should be recorded in the following template of format.

| S.No | Type of equipment | Date of Maintenance | Type of Activity | Remarks |
|---|---|---|---|---|
| 1 | Experimental Setup for Magnetization ckts of Dc Shunt Gen.for Science lab. | | Finding magnetization characteristics | **Working in good condition** |
| 2 | Experimental Setup for | | Finding the | **Working in** |

| | | | | |
|---|---|---|---|---|
| | Swinburne's test on DC Shunt M/C for Science lab. | | efficiency | **good condition** |
| 3 | Experimental Setup for brake test on DC Shunt M/r for Science lab. | | Finding the efficiency | **Working in good condition** |
| 4 | Oc & SC test on 1Ph.T/F for science lab | | For sc and oc test | **Working in good condition** |
| 5 | Experimental Setup for brake test on 3Ph. Indution M/r for Science lab. | | Finding the efficiency | **Working in good condition** |
| 6 | Experimental Setup for Regulation of alternator by Synch. for Science lab. | | Finding the regulation | **Working in good condition** |
| 7 | Rectifier 100A for science lab. | | To conver DC into AC supply | **Working in good condition** |
| 8 | 3Ph. Auto T/f 5KVA for science lab | | | **Working in good condition** |
| 9 | 1Ph. Auto T/f 15A for science lab | | | **Working in good condition** |
| 10 | DHH Tachometer for science lab | | Find the no. of revolution | **Working in good condition** |
| 11 | Meters and Instruments for science lab PMVM MC 150/300V-5No.s,25/50V PMAM 10/20A,1/2A-5NO'S eACH | | Find voltage and current | **Working in good condition** |
| 12 | Meters and Instruments for science labPMAM MI 1A,5/10A-2 No's eachPMVM MI 150/300V, 300/600V-2No's each, 25/50V - | | Find voltage and current | **Working in good condition** |

| | | | | |
|---|---|---|---|---|
| | 1No | | | |
| 13 | Meters and Instruments for science labWM LPF 75/150/300V 1/2A,300/600V 5/10A-2No's each | | Find voltage and current | **Working in good condition** |
| 14 | Meters and Instruments for science labWM UPF 75/150V 5/10A,300/600V 5/10A-2No's each | | Find voltage and current | **Working in good condition** |
| 15 | Rheostat 370 Ohm,1.7A | | To control the flow of current | **Working in good condition** |
| 16 | Rheostat 50 Ohm,5A | | To control the flow of current | **Working in good condition** |
| 17 | Rheostat 350 Ohm,2A | | To control the flow of current | **Working in good condition** |
| 19 | FT 2504D Dual (0-30)V/2 amp RPS Digital meters | | Supply the required voltage | **Working in good condition** |
| 20 | Decade resistances boxes 1Watt | | Variable resistance | **Working in good condition** |
| 21 | FT-1352 Decade capacitive box | | Variable capacitance | **Working in good condition** |
| 22 | FT-1342 Decade inductive box | | Variable inductance | **Working in good condition** |
| 23 | FT-2603 Function generator | | | **Working in good condition** |

| | | | | |
|---|---|---|---|---|
| 24 | FT-3254 DC Ammeter (0-20)mA Digital type | | Find the current | |
| 25 | FT-3264 Digital AC Ammeter (0-100)mA | | Find the current | **Working in good condition** |
| 26 | FT-3213 DC Voltmeter (0-20)v Digital type | | Find the current | **Working in good condition** |
| 27 | FT-1726 Two port networks parameter | | Find the n/w parameters | **Working in good condition** |

- Maintenance Reports duly signed by in charges as well as HODs and duly approved by Principal periodically.

**TROUBLE SHOOTING SCHEDULES:**

A proposal is to be made from each lab branchwise. The proposal should carry following details related to specific equipment in lab.

S.No., Equipment Name , Type of Problem (Too much Noise, Abnormal Sound, Corrupt Software, Anti Virus Problem, Missing of Display, CRT not working, Motor is not giving signal, Digital display is not working, Break of tools, Mis alignment of machine elements, PLC is not properly working), Expected Reasons ( Bearing failure, Improper alignment of machine centres, Missing of vibration pads etc)

Trouble shooting exercises should be properly recorded in a separate format as mentioned below:

| S.No. | Date of recording activity | Name of the Equipment | Type of Trouble | Remedial Activity | Remarks |
|---|---|---|---|---|---|
| | | | | | |

## 16. ASSESSMENT AND ACCREDITATION PROCESDURE AS PER NABL

Accreditation is the formal recognition, authorization and registration of a laboratory that has demonstrated its capability, competence and credibility to carry out the tasks. It provides the feedback to laboratories as to whether they are performing according to technical competence as per guidelines of NABL (National Accreditation Board for Testing and Calibration Laboratories)

The laboratory should carry out the following important tasks towards getting ready for accreditation from NABL.

1. Preparation of methodology in each experiment.
2. Preparation of Standard Operating procedure for each equipment
3. Preparation of Laboratory Manual as per the guidelines specified by Combined Lab Team(CLT) headed by Principal/HOD/Dean/ in charge
4. Ensure Effective environmental conditions (temperature, humidity, storage and placement) in the laboratories by implementing proper housekeeping and cleaning of the equipments from dust, dirt etc.
5. Ensure Calibration of instruments/equipment (Only NABL accredited authorized laboratories provide calibration.
6. All the details of Calibration should be included in the format specified exclusively for calibration procedure.
7. Ensure proper implementation of all the documents, formats to be included in the lab manual.
8. Impart training for all the technicians working in labs about the importance of documentation, log sheets, operating procedure of the lab.
9. Incorporate Internal Lab audits for effective functioning of the laboratories. Audits may be once in a month or 3 months or at the end of the semester. The audit schedule will be decided by the Chairman and Principal of the CLT team.
10. Auditors should submit the detailed report of each lab duly signed to the Principal.
11. Each lab should maintain all the bills/invoices of each instrument or equipment in a separate file.
12. All the stock registers either consumable or non consumable should be updated whenever any purchases of consumables or equipment takes place.
13. All the safety precautions are properly displayed in front of each lab.
14. All the Lead experiments should be maintained separately in a record /record in a separate folder.
15. Based on Pre Assessment report submitted by auditor, corrective actions should be carried out by each lab in charge and that must be forwarded to concerned HOD and Principal.

## SUBJECTWISE LAB PLANNER

## DIGITAL COMMUNICATIONS LAB

**CONTENTS:**

**1. OBJECTIVE *AND RELEVANCE***

The main objective of this lab is to gain the practical hands on experience by exposing the students to understand the fundamental concepts of digital modulation techniques, TDM, Pulse modulations and their spectral characteristics.

**2. SCOPE**

Understanding of Digital Communication lab has the scope to make the learner comfortable to work in the communication area. This subject gives us an idea or overview to learn the emerging technologies like 4G, 5G etc.

**3. PREREQUISITES**

Knowledge of signals and systems and analog communication modulation techniques is required.

**4. SYLLABUS AS PER JNTUH**

## DIGITAL COMMUNICATION

1. PCM Generation and Detection
2. Differential pulse code Modulation
3. Delta modulation
4. Adaptive delta Modulation
5. Time Division Multiplexing of 2 band limited signals
6. Frequency shift keying: Generation and Detection
7. Phase shift keying : Generation and Detection
8. Amplitude shift Keying: Generation and Detection
9. Study of spectral characteristics of PAM
10. Study of spectral characteristics of PWM
11. Study of spectral characteristics of QAM
12. DPSK Generation and Detection

**Equipment required for Laboratories:**

1. CRO - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz
6. Lab Experimental kits for Digital Communication
7. Components and probes

## MAIN LINKAGE OF DIGITAL COMMUNICATION THEORY WITH LAB EXPERIMENTS

### EXPERIMENT NO 1:

**UNIT-1:**

**EXPERIMENT NO 1:** PCM Generation & Detection

**OBJECTIVE:** To convert an analog signal into a pulse digital signal using PCM system and to convert the digital signal into analog signal using PCM demodulation system.

**PREREQUISITES:** Basic knowledge of modulation and demodulation techniques

**Description:**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of Pulse code modulation & demodulation.
d. Graphical determination of input and output waveforms of Pulse code modulation & demodulation

**APPLICATIONS:**

1. Used as A/D converter
2. Used as D/A converter

### EXPERIMENT NO 2: Differential pulse code Modulation

**UNIT-1:**

**OBJECTIVE:** To convert an analog signal into a pulse digital signal using DPCM system and to convert the digital signal into analog signal using DPCM demodulation system with less number of bits per sample compared to PCM

**PREREQUISITES:** Basic knowledge of modulation and demodulation techniques

**Description:**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of Differential Pulse code modulation & demodulation.
d. Graphical determination of input and output waveforms of Differential Pulse code modulation & demodulation

**APPLICATIONS:**

1. Used as A/D converter
2. Used as D/A converter

**EXPERIMENT NO 3**

**UNIT-1:**

**EXPERIMENT NO 3:** Delta modulation

**OBJECTIVE:** To transmit an analog message signal in its digital form and again reconstruct back the original analog message signal at receiver by using Delta modulator.

**PREREQUISITES:** Basic knowledge of modulation and demodulation techniques

**Description:**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Experimental determination of Delta modulation and Demodulation.

d. Graphical determination of input and output waveforms of Delta modulation and Demodulation

**APPLICATIONS:**

1. Used as A/D converter
2. Telephone and Radio communication

**EXPERIMENT NO 4:** Adaptive delta Modulation

**UNIT-1:**

**OBJECTIVE:** To reduce the slope overload distortion in the delta modulation.

**PREREQUISITES:** Basic knowledge of modulation and demodulation techniques

**Description:**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Experimental determination of Adaptive Delta modulation and Demodulation.

d. Graphical determination of input and output waveforms of Adaptive Delta modulation and Demodulation

**APPLICATIONS:**

1. Used as A/D converter

**EXPERIMENT NO 5:** Time Division Multiplexing of 2 band limited signals

**UNIT-1:**

**OBJECTIVE:** To transmit a multiplexed output of different frequency message signals through a single channel using TDM system and recover back the original message signals through a de-multiplexer at receiver end.

**PREREQUISITES:** Basic knowledge of multiplexing and demultiplexing techniques.

**Description:**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Experimental determination of time division multiplexing and demultiplexing.

d. Graphical determination of input and output waveforms of Time division multiplexing.

**APPLICATIONS:**

1. Used as Multiplexer
2. Used as Demultiplexer

**EXPERIMENT NO 6**

**UNIT-4:**

**EXPERIMENT NO 6:** Frequency shift keying: Generation and Detection

**OBJECTIVE:** To generate the frequency shift keying signal for a given binary data and also demodulate the original data input.

**PREREQUISITES:** Basic knowledge of shift keying techniques

**Description:**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Experimental determination of Frequency shift keying.

d. Graphical determination of input and output waveforms of Frequency shift keying.

**APPLICATIONS:**

1. Used in Bluetooth

**EXPERIMENT NO 7**

**UNIT-4:**

**EXPERIMENT NO 7:** Phase shift keying : Generation and Detection

**OBJECTIVE:** To generate the phase shift keying signal for the given binary data & to demodulated to receive the transmitted binary data.

**PREREQUISITES:** Basic knowledge of shift keying techniques

**Description:**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Experimental determination of phase shift keying.

d. Graphical determination of input and output waveforms of phase shift keying .

**APPLICATIONS:**

1. Used as phase shifter

**EXPERIMENT NO 8:**

**UNIT-4:**

**EXPERIMENT NO 8:** Amplitude shift Keying: Generation and Detection

**OBJECTIVE:** To generate the Amplitude shift keying signal for a given binary data and also demodulate the original data input.

**PREREQUISITES:** Basic knowledge of shift keying techniques

**Description:**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Experimental determination of Amplitude shift keying.

d. Graphical determination of input and output waveforms of Amplitude shift keying

**APPLICATIONS:**

1. RF Transmission

**EXPERIMENT NO 9:**

**UNIT-3:**

**EXPERIMENT NO 9:** Study of spectral characteristics of PAM

**OBJECTIVE:** To study the PAM Modulation and Demodulation techniques and observe the spectral characteristics

**PREREQUISITES:** Basic knowledge of Analog Modulation techniques.

**Description:**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Experimental determination of Pulse Amplitude Modulation and spectral characteristics

d. Graphical determination of input and output waveforms of Pulse Amplitude Modulation and spectral characteristics .

**APPLICATIONS:**

1. Used in Electronic drivers for LED lighting

2. Used in Ethernet

**EXPERIMENT NO 10:**

**UNIT-3:**

**EXPERIMENT NO 10:** Study of spectral characteristics of PWM

**OBJECTIVE:** To study the PWM Modulation and Demodulation techniques and observe the spectral characteristics.

**PREREQUISITES:** Basic knowledge of Analog Modulation techniques.

**Description:**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Experimental determination of Pulse Width Modulation and spectral characteristics

d. Graphical determination of input and output waveforms of Pulse Width Modulation and spectral characteristics.

**APPLICATIONS:**

1. used in Telecommunications
2. used in efficient voltage regulators

**EXPERIMENT NO 11:**

**UNIT-4:**

.**EXPERIMENT NO 11:** Study of spectral characteristics of QAM

**OBJECTIVE:**To study the Quadrature Modulation and Demodulation techniques and observe the spectral characteristics

**PREREQUISITES:** Basic knowledge of Analog Modulation techniques.

**Description:**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Experimental determination of Quadrature Amplitude Modulation and spectral characteristics

d. Graphical determination of input and output waveforms of Quadrature Amplitude Modulation and spectral characteristics.

**APPLICATIONS:**

1. TV Transmission
2. Wide band CDMA

**EXPERIMENT NO 12:**

**UNIT-4:**

**EXPERIMENT NO 12:** DPSK Generation and Detection

**OBJECTIVE:** To generate the Differential phase shift keying signal for the given binary data & to demodulated to receive the transmitted binary data.

**PREREQUISITES:** Basic knowledge of shift keying techniques

**Description:**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Experimental determination of Differential phase shift keying.

d. Graphical determination of input and output waveforms of Differential phase shift keying .

**APPLICATIONS:**

1. CDMA, WiMAX , WLAN , Satellite, Cable modem etc

## 5. LEAD EXPERIMENT

**EXPERIMENT NO 13: Data Encryption and Decryption**

**OBJECTIVE:**

Encryption is the process of translating plain text data (*plaintext*) into something that appears to be random and meaningless (*ciphertext*). Decryption is the process of converting ciphertext back to plaintext.

**PREREQUISITES:** Basic knowledge of digital communication

**Description:**

a. Introduction to experiment -30 min
b. writing the program for Encryption and Decryption
c. Debugging
d. Execution

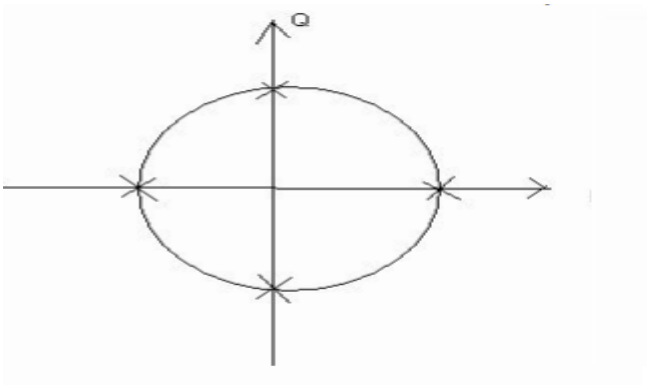
**APPLICATIONS:**

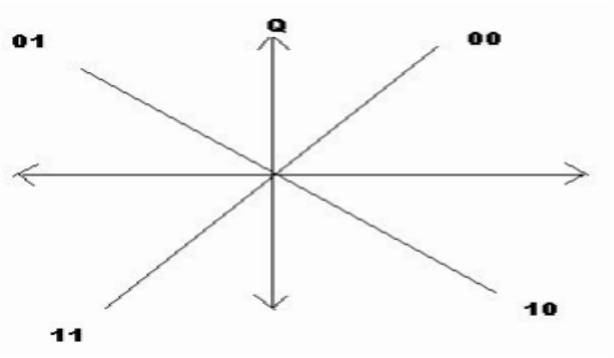
1. Data security applications

## 6. VIRTUAL LAB EXPERIMENT

**AIM: -** To plot the wave form for Quadrature Phase Shift Keying (QPSK) signal using MATLAB for a stream of bits.

**THEORY:-** Quadrature Phase Shift Keying (QPSK) is the digital modulation technique.Quadrature Phase Shift Keying (QPSK) is a form of Phase Shift Keying in which two bits are modulated at once, selecting one of four possible carrier phase shifts (0, Π/2, Π, and 3Π/2). QPSK perform by changing the phase of the In-phase (I) carrier from 0° to 180° and the Quadrature-phase (Q) carrier between 90° and 270°. This is used to indicate the four states of a 2-bit binary code. Each state of these carriers is referred to as a Symbol.




QPSK perform by changing the phase of the In-phase (I) carrier from 0° to 180° and the Quadrature-phase (Q) carrier between 90° and 270°. This is used to indicate the four states of a 2-bit binary code. Each state of these carriers is referred to as a Symbol. Quadrature Phase-shift Keying (QPSK) is a widely used method of transferring digital data by changing or modulating the

phase of a carrier signal. In QPSK digital data is represented by 4 points around a circle which correspond to 4 phases of the carrier signal. These points are called symbols. Fig. shows this mapping.

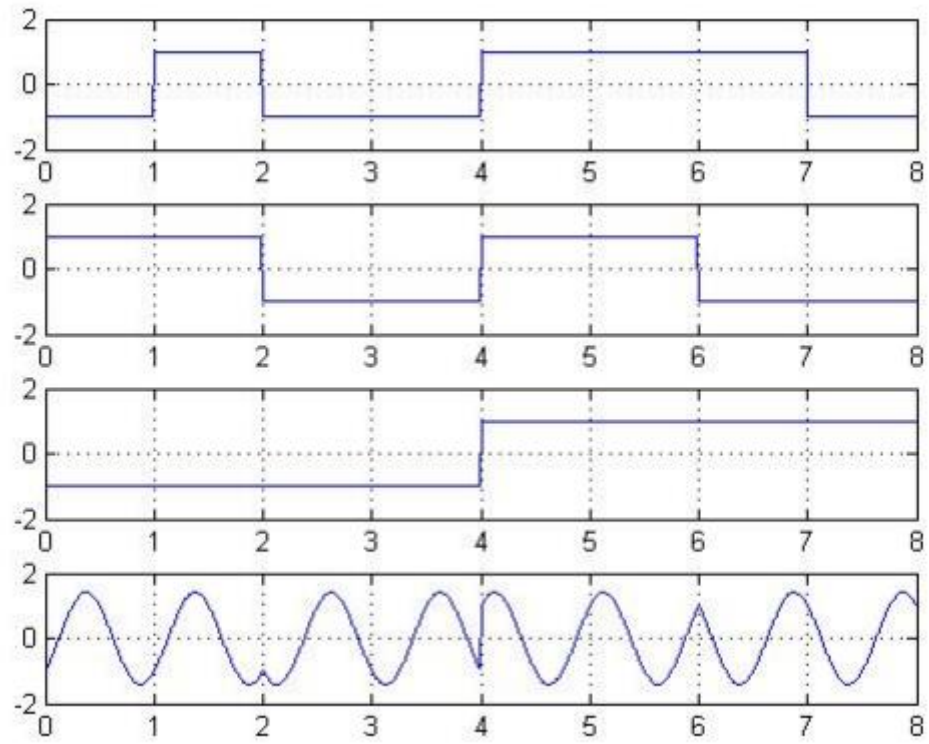
**MATLAB PROGRAM:-**

```
clear;
 clc;
 b = input('Enter the Bit stream \n '); %b = [0 1 0 1 1 1 0];
 n = length(b);
 t = 0:.01:n;
 x = 1:1:(n+2)*100;
for i = 1:n
 if (b(i) == 0)
 b_p(i) = -1;
 else
b_p(i) = 1;
end
for j = i:.1:i+1
bw(x(i*100:(i+1)*100)) = b_p(i);
 if (mod(i,2) == 0)
 bow(x(i*100:(i+1)*100)) = b_p(i);
 bow(x((i+1)*100:(i+2)*100)) = b_p(i);
else
 bew(x(i*100:(i+1)*100)) = b_p(i);
 bew(x((i+1)*100:(i+2)*100)) = b_p(i);
end
 if (mod(n,2)~= 0)
```

```
bow(x(n*100:(n+1)*100)) = -1;
bow(x((n+1)*100:(n+2)*100)) = -1;
 end
 end
end
%be = b_p(1:2:end);
 %bo = b_p(2:2:end);
bw = bw(100:end);
 bew = bew(100:(n+1)*100);
bow = bow(200:(n+2)*100);
cost = cos(2*pi*t);
sint = sin(2*pi*t);
 st = bew.*cost+bow.*sint;
subplot(4,1,1)
plot(t,bw)
 grid on ;
axis([0 n -2 +2])
subplot(4,1,2)
plot(t,bow)
grid on ;
axis([0 n -2 +2])
subplot(4,1,3)
plot(t,bew)
 grid on ;
axis([0 n -2 +2])
```

```
subplot(4,1,4)
 plot(t,st)
 grid on ;
axis([0 n -2 +2])
```

**OBSERVATION:-** Output waveform for the bit stream [0 1 0 0 1 1 1 0]



## 7. SUGGESTED TEXT BOOKS

### TEXT BOOKS:

1. Principles of Communication Systems – H. Taub and D. Schilling,Gautam Saha,3rd Edition,McGraw-Hill,2008
2. Digital and Analog Communication Systems - Sam Shanmugam, John Wiley, 2005.

### REFERENCES :

1. Digital Communications – John G.Proakis, Masoud salehi-5th Edition, Mc Graw-Hill,2008.
2. Digital communications - Simon Haykin, John Wiley, 2005.

3. Digital communications-Ian A.Glover, Peter M.Grant, 2nd Edition, Pearson Edu.,2008.
4. Communication Systems – B.P.Lathi, BS Publication, 2006.

## 8. WEBSITES

1. www.complextoreal.com
2. www.nptel.iitm.ac.in
3. www.eecs.berkeley.edu
4. www.sp4comm.org
5. www.springer.com
6. www.iitd.ernet.in
7. www.iitb.ac.in
8. www.iitm.ac.in
9. www.iitr.ac.in
10. www.iitg.ernet.in
11. www.bits-pilani.ac.in
12. www.bitmesra.ac.in
13. www.steepestascent.com
14. www.ece.utah.edu
15. www.worldcolleges.info
16. www.ieee.org
17. www.ee.unb.ca
18. www.wikipedia.com

## 9. EXPERT DETAILS

### INTERNATIONAL:

1. Samuel Y. Liao, professor of electrical Engineering, California University.
2. Philip F.Ordung, professor of electrical Engineering, Yale University.

### NATIONAL

1. Manojith Mishra prof. & Head, Deptt. Of Tele communication Engg. B.E College Howrah
2. Prof. S. Bhaskaran - Head, Dept of Electronics, Velammal Engg College Chennai

### REGIONAL

1. Prof. N.S. Murthy , Dept. of ECE, NIT, Warangal
2. Mr. T. Subba Rao ,HOD, Dept. of ECE, University college Engineering.

### 10 (A).LAB SCHEDULE:

The lab schedule should be planned once in a week. The week wise scheduled experiment should be completed.

**CYCLE 1 (For 30 students per session and 3 students per batch)**

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 | week-8 |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| B1, B2 | Demo | Exp.1 | Exp.2 | Exp.10 | Exp.9 | Exp.7 | Exp.8 | Lead1 |
| B3, B4 | Demo | Exp.2 | Exp.10 | Exp.9 | Exp.8 | Exp.1 | Exp.3 | Lead1 |
| B5, B6 | Demo | Exp.10 | Exp.9 | Exp.8 | Exp.1 | Exp.2 | Exp.7 | Lead1 |
| B7, B8 | Demo | Exp.9 | Exp.8 | Exp.1 | Exp.3 | Exp.10 | Exp.2 | Lead1 |
| B9, B10 | Demo | Exp.8 | Exp.1 | Exp.2 | Exp.7 | Exp.3 | Exp.10 | Lead1 |

**CYCLE 2(For 30 students per session and 3 students per batch)**

| **Batches** | **week-1** | **week-2** | **week-3** | **week-4** | **week-5** | **week-6** | week-7 | week-8 |
|---|---|---|---|---|---|---|---|---|
| B1, B2 | Exp.3 | Exp.4 | Exp.6 | Exp.11 | Exp.12 | Exp.5 | Hobby/lead2 | Test |
| B3, B4 | Exp.7 | Exp.6 | Exp.11 | Exp.12 | Exp.5 | Exp.4 | Hobby/lead2 | Test |
| B5, B6 | Exp.3 | Exp.11 | Exp.12 | Exp.5 | Exp.4 | Exp.6 | Hobby/lead2 | Test |
| B7, B8 | Exp.7 | Exp.12 | Exp.5 | Exp.4 | Exp.6 | Exp.11 | Hobby/lead2 | test |
| B9, B10 | Exp.9 | Exp.5 | Exp.4 | Exp.6 | Exp.11 | Exp.12 | Hobby/lead2 | test |

## (B).VIVA SCHEDULE

**ROUND – 1 (For 30 students per session and 3 students per batch)**

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 |
|---|---|---|---|---|---|---|---|
| B1,B2,B3 | viva | | | | | | |
| B4,B5,B6 | | viva | | | | | |
| B7,B8,B9 | | | viva | | | | |
| B10,B11,B12 | | | | viva | | | |
| B13,B14,B15 | | | | | viva | | |
| B16.B17,B18 | | | | | | viva | |
| B19,B20 | | | | | | | Viva |

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 |
|---|---|---|---|---|---|---|---|
| SG1 | Viva | | | | | | |
| SG2 | | viva | | | | | |
| SG3 | | | viva | | | | |
| SG4 | | | | Viva | | | |
| SG5 | | | | | viva | | |
| SG6 | | | | | | viva | |
| SG7 | | | | | | | Viva |

**ROUND – 2**

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 |
|---|---|---|---|---|---|---|---|
| B1,B2,B3 | viva | | | | | | |
| B4,B5,B6 | | viva | | | | | |
| B7,B8,B9 | | | viva | | | | |
| B10,B11,B12 | | | | viva | | | |
| B13,B14,B15 | | | | | viva | | |
| B16.B17,B18 | | | | | | viva | |
| B19,B20 | | | | | | | Viva |

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 |
|---|---|---|---|---|---|---|---|
| SG1 | Viva | | | | | | |
| SG2 | | viva | | | | | |
| SG3 | | | viva | | | | |
| SG4 | | | | Viva | | | |
| SG5 | | | | | viva | | |
| SG6 | | | | | | viva | |
| SG7 | | | | | | | Viva |

**(C). SCHEME OF EVALUTION**

**LAB EXTERNAL**

| S no. | Write-up ( by Internal | Final evaluation (Internal Examiner) | Viva (External |
|---|---|---|---|
| 1 | Aim<br>Equipment needed<br>Circuit diagram<br>Procedure<br>Precautions<br>Tabular form<br>Expected graph | Based on observation, how the student is connecting the circuit, usage of equipment and typical readings<br>And based on correctness of the practical graph to the expected graph and results. | Based on understanding of Experiment and theoretical questions in the related subject. |
| | **Marks: 30** | **Marks: 30** | **Marks: 15** |
| **Total Marks:30+30+15=75 Marks** | | | |

**LAB INTERNAL**

| **Day to Day Evaluation ------ 15 Marks** | | | | | **Internal Exam ---10M Marks** | | |
|---|---|---|---|---|---|---|---|
| Uniform | Observation & Record | Performance of experiment | Result | Viva Voce | Write-up | Connections & Result | Viva Voce |
| **Marks:3** | **Marks:3** | **Marks:3** | **Marks:3** | **Marks:3** | **Marks:4** | **Marks:3** | **Marks:3** |
| **Total Marks:15+10=25 Marks** | | | | | | | |

## 11. PROJECT/PAPER/PRODUCT BASED LEARNING:

### Minimum Shift Keying used for satellite communications using MATLAB

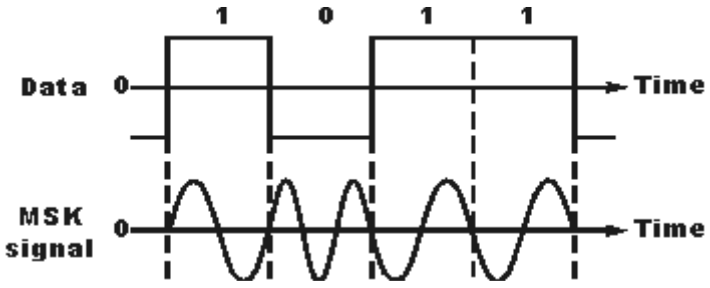
## ABSTRACT:

In digital modulation, **minimum-shift keying** (**MSK**) is a type of continuous-phase frequency-shift keying that was developed in the late 1950s and 1960s. Similar to OQPSK, MSK is encoded with bits alternating between quadrature components, with the Q component delayed by half the symbol period. However, instead of square pulses as OQPSK uses, MSK encodes each bit as a half sinusoid. This results in a constant-modulus signal (constant envelope signal), which reduces problems caused by non-linear distortion. In addition to being viewed as related to OQPSK, MSK can also be viewed as a continuous phase frequency shift keyed (CPFSK) signal with a frequency separation of one-half the bit rate.

In MSK the difference between the higher and lower frequency is identical to half the bit rate. Consequently, the waveforms used to represent a 0 and 1 bit differ by exactly half a carrier period. Thus, the maximum frequency deviation is = 0.25 ***fm*** where ***fm*** is the maximum modulating frequency. As a result, the modulation index *m* is 0.5. This is the smallest FSK modulation index that can be chosen such that the waveforms for 0 and 1 are orthogonal. A variant of MSK called GMSK is used in the GSM mobile phone standard. In addition to this MSK has advantages over other forms of PSK and as a result it is used in a number of radio communications systems.

**Reason for Minimum Shift Keying, MSK:**

It is found that binary data consisting of sharp transitions between "one" and "zero" states and vice versa potentially creates signals that have sidebands extending out a long way from the carrier, and this creates problems for many radio communications systems, as any sidebands outside the allowed bandwidth cause interference to adjacent channels and any radio communications links that May be using them.




**Signal using MSK modulation Algorithm:** Initialization commands **MSK modulation:**

1. Generate carrier signal.
2. Start FOR loop
3. Generate binary data, message signal (on-off form)
4. Generate MSK modulated signal.
5. Plot message signal and MSK modulated signal.
6. End FOR loop.
7. Plot the binary data and carrier.

**MSK Demodulation:**

1. Start FOR loop
2. Perform correlation of MSK signal with carrier to get decision variable
3. Make decision to get demodulated binary data. If x>0, choose '1' else choose '0'
4. Plot the demodulated binary data.

**12. MAPPING OF LAB WITH PROJECT/ CONSULTANCY/ R&D:**

**PROPOSALS 2:**

## Study the OFDM Transmitter System on Mat lab

**Abstract**— Orthogonal frequency-division multiplexing (OFDM) is a method of encoding digital data on multiple carrier frequencies. OFDM has developed into a popular scheme for wideband digital communication, used in applications such as digital television and audio broadcasting, DSL Internet access, wireless networks, powerline networks, and 4G mobile communications.

## FUNDED/UNFUNDED PROPOSALS (if any)

**TITLE:** Seminar on Advancement in Digital communication applications oriented approach.

**OBJECTIVE:**

This seminar program is intended to bring down the awareness among all Students and staff in order to study the various applications of communication systems like wired and wireless communication systems.

**13. GUIDELINES FOR SHADOW ENGINEERING (VIP) AND INDUSTRIAL VISITS (IIP – INNOVATIVE INDUSTRIAL LEARNING PROGRAM)**

**INDUSTRIAL VISITS**

| S. No | Type of industry | Nature of industry | Date of visit | No. of students participated | Year/branch | Remarks |
|---|---|---|---|---|---|---|
| 1 | BSNL | Telecom | | | III/ECE | |
| 2 | Doordarshan kendra | Telecasting | | | III/ECE | |

**TABLE 2: INDUSTRIAL TRAINING (SHADOW ENGINEERING)**

| S. No | Name of the Course | Nature of industry | Duration of Training | Authority | Date of Training/Certificate No. | remarks |
|---|---|---|---|---|---|---|
| 1 | OFC | Advanced Training Institute for Electronics and Process Instrumentation | 1 Week | GM | | |
| | | | | | | |

## 14. ACTIVITIES IN LIFT PROGRAM

### CALIBRATION

Calibration: Aim of this concept is to check:

i. whether all the equipment is functioning correctly as per the standards
ii. To bring correctness in the errors of instrument or equipment.
iii. To rectify the errors if any

Installation: Aim of this concept is to make and maintain installation procedure for a New equipment or already existing equipment

Testing : Aim of this concept is to test the equipment after installation whether it Meets the existing standards.

The list of equipments (hardware/software):

Necessity of tools for development and testing
Equipment to be calibrated
Installation of supporting equipment if any.

### PROCEDURE FOR CALIBRATION:

Any Equipment or Instrument or Gauge or Machine can be calibrated as the standard guidelines mentioned under:

1. Identify the Equipment/Instrument/Gauge/Machine which is under defective or to be calibrated or correction for error
2. Identify the type of error and estimate its frequency of variation.
3. Check with Master Standards or equipment/instrument/machine which is working correctly and meeting our requirements.
4. Estimate the frequency of deviations from normal mode.

5. If the equipment is under warranty, then inform to concerned supplier or agency that will carry out calibration.
6. If the equipment is out of warranty then we can compare the deviations and set the error rectification.
7. Generally as per the procedure, the equipment or instruments can be calibrated by the agencies and issue calibration certificate which consists of date of calibration, calibration next due date and remarks as mentioned in the following format.
8. Record and keep all the calibration certificates in safe custody.

**After calibration the details of equipment should be submitted in following format**

| S.no | Type of equipment | Certificate no | Certificate issued by | Date of calibration | Date of calibration due | Remarks |
|---|---|---|---|---|---|---|
| 1 | Cathode ray Oscilloscope | | SS Instruments, Kukatpally | | | |
| 2 | Trainer Kits | | SS Instruments, Kukatpally | | | |

## 15. MAINTAINANCE AND TROUBLESHOOTING

**Maintenance:**

Maintenance and trouble shooting of each equipment in a laboratory must follow the following guidelines:

Maintenance Schedules:

(1) Preventive Maintenance Schedules of lab will be decided by lab in charge along with concerned HOD. The details of schedule should be recorded in the following template of format.

| S.No. | Name of the Equipment | Date of Maintenance | Type of Activity | Remarks |
|---|---|---|---|---|
| 1 | Cathode ray Oscilloscope | | Cleaning and Servicing | Working well |
| 2 | Trainer Kits | | Testing and Troubleshooting | Working OK |

**(2)** Maintenance Reports duly signed by in charges as well as HODs and duly approved by Principal periodically.

**TROUBLE SHOOTING SCHEDULES:**

A proposal is to be made from each lab branch wise. The proposal should carry following details related to specific equipment in lab.

S.No., Equipment Name , Type of Problem (Too much Noise, Abnormal Sound, Corrupt Software, Anti Virus Problem, Missing of Display, CRT not working, Motor is not giving signal, Digital display is not working, Break of tools, Mis alignment of machine elements, PLC is not

properly working), Expected Reasons ( Bearing failure, Improper alignment of machine centres, Missing of vibration pads etc)Trouble shooting exercises should be properly recorded in a separate format as mentioned below:

| S.No. | Date of recording activity | Equipment Name | Type of Trouble | Remedial Activity | Remarks |
|---|---|---|---|---|---|
| | | | | | |

## 16. ASSESSMENT AND ACCREDITATION PROCESDURE AS PER NABL

Accreditation is the formal recognition, authorization and registration of a laboratory that has demonstrated its capability, competence and credibility to carry out the tasks. It provides the feedback to laboratories as to whether they are performing according to technical competence as per guidelines of NABL (National Accreditation Board for Testing and Calibration Laboratories)

The laboratory should carry out the following important tasks towards getting ready for accreditation from NABL.

1. Preparation of methodology in each experiment
2. Preparation of Standard Operating procedure for each equipment
3. Preparation of Laboratory Manual as per the guidelines specified by Combined Lab Team(CLT) headed by Principal/HOD/Dean/incharge
4. Ensure Effective environmental conditions(temperature, humidity,storage and placement) in the laboratories by implementing proper housekeeping and cleaning of the equipments from dust, dirt etc.
5. Ensure Calibration of instruments/equipment(Only NABL accredited authorized laboratories provide calibration.
6. All the details of Calibration should be included in the format specified exclusively for calibration procedure.
7. Ensure proper implementation of all the documents, formats to be included in the lab manual.
8. Impart training for all the technicians working in labs about the importance of documentation, log sheets, operating procedure of the lab.
9. Incorporate Internal Lab audits for effective functioning of the laboratories. Audits may be once in a month or 3 months or at the end of the semester. The audit schedule will be decided by the Chairman and Principal of the CLT team.
10. Auditors should submit the detailed report of each lab duly signed to the Principal.
11. Each lab should maintain all the bills/invoices of each instrument or equipment in a separate file.
12. All the stock registers either consumable or non consumable should be updated whenever any purchases of consumables or equipment takes place.

13. All the safety precautions are properly displayed in front of each lab.
14. All the Lead experiments should be maintained separately in a record /record in a separate folder.
15. Based on Pre Assessment report submitted by auditor, corrective actions should be carried out by each lab in charge and that must be forwarded to concerned HOD and Principal.

# SUBJECTWISE LAB PLANNER

## LINEAR IC APPLICATIONS LAB

**CONTENTS:**

## 1. OBJECTIVES AND RELEVANCE

The main objective of this lab course is to gain the practical hands on experience by exposing the students to various linear IC applications. The students will have an understanding of the concepts involved in various Linear integrated circuits and their various applications. Through this lab the students will get a thorough understanding of various linear ICs and finally this lab introduces the 741 operational amplifiers, 555 timer , and IC 723 and its various applications.

## 2. SCOPE

This lab is more useful in Understanding of Linear IC Applications and understanding the application of IC's in consumer electronic industries to manufacture the electronic appliances.

## 3. PREREQUISITES

Theoretical knowledge on subject Integrated Circuit Applications also requires the awareness of various analog electronics like electronic devices and circuits, pulse digital circuits and network analysis.

## 4. SYLLABUS-JNTUH

**List of Experiments:**

**Design and Implementation of:**

1. Inverting and Non-inverting Amplifiers using Op Amps.
2. Adder and Subtractor using Op Amp.
3. Comparators using Op Amp.
4. Integrator Circuit using IC 741.
5. Differentiator circuit using Op Amp.
6. Active Filter Applications – LPF, HPF (first order)
7. IC 741 Waveform Generators – Sine, Square wave and Triangular waves.
8. Mono-stable Multivibrator using IC 555.
9. Astable Multivibrator using IC 555.
10. Schmitt Trigger Circuits – using IC 741.
11. IC 565 – PLL Applications.
12. Voltage Regulator using IC 723.
13. Three Terminal Voltage Regulators –7805, 7809, 7912.

**UNIT –I**

**EXPERIMENT NO. 1**

Inverting and Non-Inverting amplifier using Op-Amp.

**OBJECTIVE**

To study the Inverting and Non-Inverting amplifier using Op-Amp.

**PREREQUISITES**

Basic knowledge about Electronic Devices and Circuits , Operation of IC 741 ,Regulated Power Supply, Function Generator, CRO.

**DESCRIPTION**

a. Introduction to experiment -30 min.
b. Connection of experiment and its verifications.
c. Experimental determination of Inverting and Non-Inverting amplifier.
d. Graphical determination of input and output waveforms of comparator.

**APPLICATIONS**

The applications of comparator are

1. Zero crossing detectors.
2. Window detector.
3. Time marker generator.
4. Phase meter.

**UNIT –I**

**EXPERIMENT NO. 2**

Adder, Subtractor- using Op-Amp.

**OBJECTIVE**

To study the applications of IC 741 as adder, subtractor.

**PREREQUISITES**

Basic knowledge about Electronic Devices and Circuits , Operation of IC 741 ,Regulated Power Supply, Function Generator, CRO.

**DESCRIPTION**

a. Introduction to experiment -30 min.
b. Connection of experiment and its verifications.
c. Experimental determination of Adder, Subtractor.
d. Graphical determination of input and output waveforms of comparator.

**APPLICATIONS**

The applications of comparator are

5. Zero crossing detectors.
6. Window detector.
7. Time marker generator.
8. Phase meter.

**UNIT –I**

**EXPERIMENT NO. 3**

Comparator- using Op-Amp.

**OBJECTIVE**

To study the applications of IC 741 as Comparator.

**PREREQUISITES**

Basic knowledge about Electronic Devices and Circuits , Operation of IC 741 ,Regulated Power Supply, Function Generator, CRO.

**DESCRIPTION**

a. Introduction to experiment -30 min.
b. Connection of experiment and its verifications.
c. Experimental determination of Comparator.
d. Graphical determination of input and output waveforms of comparator.

**APPLICATIONS**

The applications of comparator are

1. Zero crossing detectors.
2. Window detector.
3. Time marker generator.
4. Phase meter.

**EXPERIMENT NO. 4**

Integrator Circuit using IC 741.

**OBJECTIVE**

To design and verify the operation of an integrator for a given input.

**PREREQUISITES**

Basic knowledge about Electronic Devices and Circuits , Operation of IC 741, Regulated Power Supply, Function Generator, CRO .

**DESCRIPTION**

a. Introduction to experiment -30 min.
b. Connection of experiment and its verifications.
c. Experimental determination of an integrator for a given input.
d. Graphical determination of input and output waveforms of integrator.

**APPLICATIONS**

1. The integrator is used in analog computers and analog to digital converters and signal-wave shaping circuits.

**EXPERIMENT NO. 5**

Differentiator circuit using Op Amp.

**OBJECTIVE**

To design and verify the operation of differentiator for a given input.

**PREREQUISITES**

Basic knowledge about Electronic Devices and Circuits , Operation of IC 741, Regulated Power Supply, Function Generator, CRO .

**DESCRIPTION**

a. Introduction to experiment -30 min.
b. Connection of experiment and its verifications.
c. Experimental determination of differentiator for a given input.
d. Graphical determination of input and output waveforms of differentiator.

**APPLICATIONS**

2. The differentiator used in wave shaping circuits to detect high frequency components in an input signal and also as a rate of change of frequency detector in FM demodulators.

**EXPERIMENT NO. 6**

Active Filter Applications – LPF, HPF (first order)

**OBJECTIVE**

To study Op-Amp as first order LPF and first order HPF and to obtain frequency response.

**PREREQUISITES**

Basic knowledge about Electronic Devices and Circuits , Operation of IC 741 ,Regulated Power Supply, Function Generator, CRO .

**DESCRIPTION**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of frequency response for first order low pass & high pass filter.
d. Graphical determination of input and output waveforms of first order low pass & high pass filter.

**APPLICATIONS**

High-pass filters have many applications.

1. They are used as part of an audio crossover to direct high frequencies to a tweeter while attenuating bass signals which could interfere with, or damage, the speaker.
2. High-pass filters are also used for AC coupling at the inputs of many audio power amplifiers.

## EXPERIMENT NO. 7

IC 741 waveform generators-sine, square wave and triangular waves.

**OBJECTIVE**

To study the operation of waveform generators by using IC 741.

**PREREQUISITES**

Basic knowledge about Electronic Devices and Circuits , Operation of IC 741, Regulated Power Supply, Function Generator, CRO.

**DESCRIPTION**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of 3 to 8 decoder by verifying truth table.

**APPLICATIONS**

Waveform generators are used to generate the different types of signals, in communication.

**UNIT-II**

**EXPERIMENT NO. 8**

IC 555 Timer as Mono-stable Operation Circuit.

**OBJECTIVE**

To generate a pulse using Mono-stable Multi-vibrator by using IC555.

**PREREQUISITES**

Basic knowledge about Electronic Devices and Circuits , Operation of IC 555, Regulated Power Supply, Function Generator, CRO.

**DESCRIPTION**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of frequency response for Mono-stable Multi-vibrator.
d. Graphical determination of output waveform and measure the pulse duration.

**APPLICATIONS**

1. Missing Pulse Detector.
2. Frequency Divider.
3. PWM.
4. Linear Ramp Generator

**EXPERIMENT NO. 9**

IC 555 Timer as Astable Operation Circuit.

**OBJECTIVE**

To generate a pulse using Astable Multi-vibrator by using IC555.

**PREREQUISITES**

Basic knowledge about Electronic Devices and Circuits , Operation of IC 555, Regulated Power Supply, Function Generator, CRO.

**DESCRIPTION**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of frequency response for Astable Multi-vibrator.
d. Graphical determination of output waveform and measure the pulse duration.

**APPLICATIONS**

1. Morse code generators
2. PPM.
3. Square Wave Generator

**EXPERIMENT NO. 10**

Schmitt trigger circuits using IC 741

**OBJECTIVE**

To design the Schmitt trigger circuit using IC 741.

**PREREQUISITES**

Basic knowledge about Electronic Devices and Circuits , Operation of IC 741 Regulated Power Supply, Function Generator, CRO .

**DESCRIPTION**

a. Introduction to experiment -30 min.
b. Connection of experiment and its verifications.
c. Experimental determination of Schmitt trigger.
d. Graphical determination of UTP and LTP of the Schmitt trigger.

**APPLICATIONS**

Schmitt triggers are typically used in open loop configurations for noise immunity and closed loop configurations to implement function generators

**EXPERIMENT NO. 11**

IC 565 PLL Applications.

**OBJECTIVE**

To study and verify the operation of NE 565 PLL.

**PREREQUISITES**

Basic knowledge about Electronic Devices and Circuits , Operation of IC 565, Regulated Power Supply, Function Generator, CRO.

**DESCRIPTION**

a. Introduction to experiment -30 min.
b. Connection of experiment and its verifications .
c. Experimental determination of operation of NE 565 PLL.
d. Graphical determination of output waveform and measure the pulse duration.

**APPLICATIONS**

Phase-locked loops are widely employed in

1. Radio.
2. Telecommunications.
3. Computers and other electronic applications.

They can be used to recover a signal from a noisy communication channel, generate stable frequencies at a multiple of an input frequency (frequency synthesis), or distribute clock timing pulses in digital logic designs such as microprocessors

**EXPERIMENT NO. 12**

Voltage Regulator using IC 723

**OBJECTIVE**

To design a low voltage variable regulator of 2 to 7V using IC 723.

**PREREQUISITES**

Basic knowledge about Electronic Devices and Circuits , Operation of IC 723,Regulated Power Supply, Function Generator, CRO.

**DESCRIPTION**

a. Introduction to experiment -30 min.
b. Connection of experiment and its verifications.
c. Experimental determination of characteristics of a voltage variable regulator.
d. Graphical determination of Load and Line Regulation characteristics.

**APPLICATIONS**

Voltage regulators are used as
1. Control circuits in PWM.
2. Series type switch mode supplies.
3. Regulated power supplies.
4. Voltage stabilizers.

**EXPERIMENT NO. 13**

Three Terminal Voltage Regulators –7805, 7809, 7912.

**OBJECTIVE**

Study the operation of Three terminal fixed Voltage regulators using ICs 7805, 7809, 7912 ( Positive and Negative Voltage Regulators).

**PREREQUISITES**

Basic knowledge about Electronic Devices and Circuits, Operation of IC 7805, 7809, 7912, Function Generator, CRO .

**DESCRIPTION**

a. Introduction to experiment -30 min.
b. Connection of experiment and its verifications.
c. Experimental determination of characteristics of a voltage variable regulator.
d. Graphical determination of Load and Line Regulation characteristics.

**APPLICATIONS**

Voltage regulators are used as
1. Control circuits in PWM.
2. Regulated power supplies.
4. Voltage stabilizers.

## 5. LEAD EXPERIMENT

### TV Remote Control Jammer

Basically the TV remote emits a sequence of pulses when you press a button. IR transmitter is fixed to the surface of the TV remote. This IR transmitter emits the pulses in unique configuration for each button.

IR receiver which is arranged to TV will receive this sequence of pulses that are transmitted by TV Remote and identify which button is pressed in TV remote.

Generally Philips TV remotes follows RC5 (Remote Control) protocol. This protocol was developed by Philips in the late 1980s. According to this protocol, for each button, Remote transmits 14 bits.

**Circuit Components:**

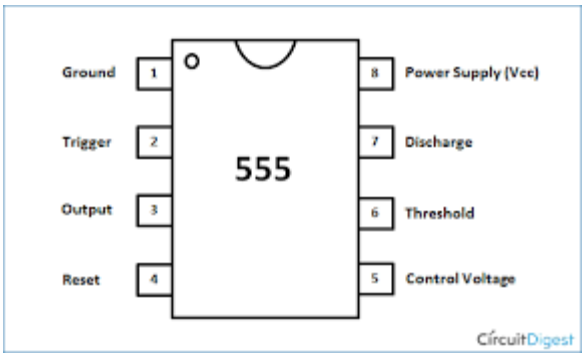
- NE555 timer
- 1n4148 diodes -2
- Resistors – 470 ohm, 1k, 5R6
- Pot – 10k
- 9V Battery
- Ceramic capacitor – 10nF
- Transistor – NPN
- IR – LED

**TV Remote Jammer Circuit Design:**

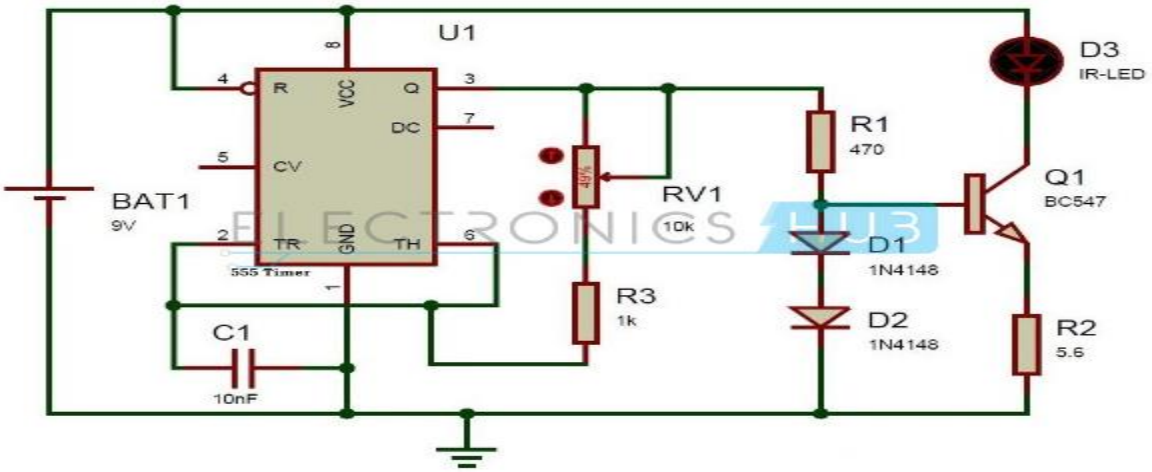
The circuit is designed to produce a 38 KHz signal. The main component in this circuit is 555 Timer. Here, it is operated in astable multivibrator mode. In this circuit, 2nd and 6th pins are shorted to allow the triggering after every timing cycle and these two pins are grounded through the capacitor. 4th pin of 555 timer is connected to supply to avoid sudden resets.

10k pot is used to adjust the frequency of 555 timer. The current through the IR-LED is limited to 100mA because of two 1n4148 diodes, as these form constant current arrangement when combined with transistor and resistor.

**Circuit Diagram:**




Pin Diagram of 555 Timer




**How to Operate this TV Remote Control Jammer Circuit?**

- Connect 9v battery to the circuit.
- Now adjust the pot 10k to produce 38 KHz signal.
- Now press the TV remote buttons.
- You can observe that TV will not receive any commands from remote
- Disconnect the battery from circuit and press TV remote buttons.
- Now you can observe that TV will receive the commands from Remote

**TV Remote Control Jammer Circuit Advantages:**

1. We can use this circuit to jam the remote signals so that the other people cannot change the channel while watching our favorite program on TV.

2. It will not affect the signal receiving capacity of the TV.

**Limitations of the Circuit:**

- The circuit should be tuned correctly to 38 KHz frequency to get accurate results.

or

## 2) Positive and Negative Reference Supply

**Aim:** To study and analyze the operation of Positive and Negative Reference Supply Circuits.

**Apparatus:**

| S.No | Name of the Component | Specifications | Quantity |
|---|---|---|---|
| 1. | IC | 741 | 1 |
| 2. | Resistor | 6.6K,1K | 2 |
| 3. | Variable Resistor | 10K | 1 |
| 4. | Zener Diode | 3.3V,400mW | 1 |
| 5. | Multimeter | - | 1 |
| 6. | Power Supply | 0-30V | 1 |
| 7. | Bread Board | - | 1 |
| 8. | Connecting Wires | - | As per requirement |

**Circuit Diagram:**

**Positive Voltage Reference Supply:**

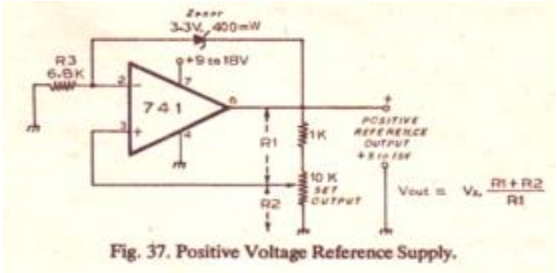



Fig. 37. Positive Voltage Reference Supply.

**Negative Voltage Reference Supply:**

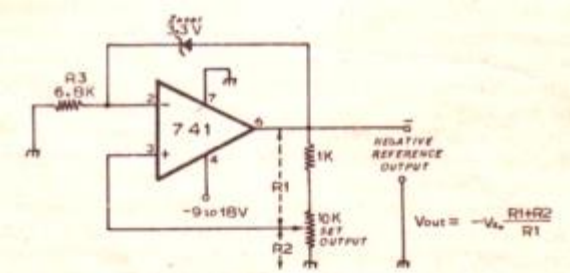



Fig. 38. Negative Voltage Reference Supply.

**Description:**

Basically, the circuit is a dc amplifier in which the negative feedback is via a zener diode. Within limits, the output voltage is determined by the formula given in the figure. Its operates based on Zener diode. The Zener diode is connected in forward bias for Positive Voltage Reference Supply, in reverse bias for negative voltage reference supply.

**Result:**

The positive and negative supply voltages are verified theoretically and practically.

## 6. VIRTUAL LAB EXPERIMENT

### i) Monostable and Astable Multivibrator by using Simulink/Virtual Breadboard software.

**Introduction**

Applications such as oscillators, pulse generators, ramp or square wave generators, multivibrators require a circuit capable of timing intervals. The most popular circuit is the 555 timer. The IC is consisting of combinations of linear comparators and digital flip flops. The IC 555 is reliable and easy to use for various applications. The entire IC is housed in eight pin package. The IC can operate from 5 to 18 V. The timer IC 555 consist of two transistors, two comparators, three equal resistors, flip flop and output stage. A series connection of three equal resistors sets the reference voltage level of the two comparators at 2VCC/3 and VCC/3 the output of these comparators setting or resetting the flip/flop unit. The IC timer 555 has two operational modes, monostable or astable multivibrator. The IC 555 available in two packages DIP and TO99.

**Pin Description of IC555 Timer**

• pin1. - Ground, The ground pin connects the 555 timer to the negative (0v) supply rail.

• Pin2. - Trigger, The negative input to comparator No 1. A negative pulse on this pin "sets"☐ the internal Flip-flop when the voltage drops below 1/3Vcc causing the output to switch from a "LOW" to a "HIGH" state.

• Pin3. - Output, The output pin can drive any TTL circuit and is capable of sourcing or sinking up

to 200mA of current at an output voltage equal to approximately Vcc - 1.5V so small speakers, LEDs or motors can be connected directly to the output.

• Pin4. - Reset, This pin is used to "reset" the internal Flip-flop controlling the state of the output, pin 3. This is an active-low input and is generally connected to a logic "1"☐ level when not used to prevent any unwanted resetting of the output.

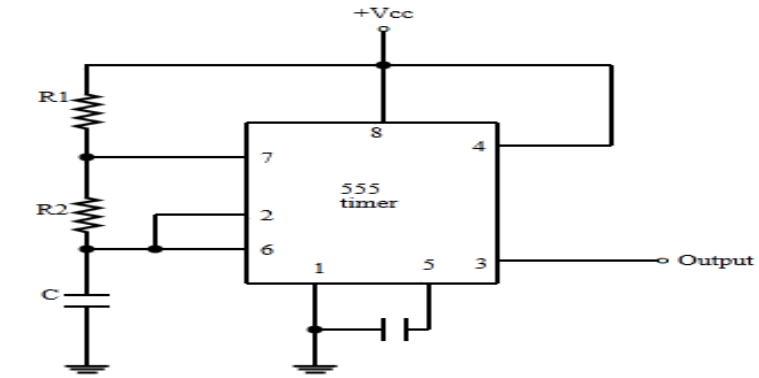
• Pin5. - Control Voltage, This pin controls the timing of the 555 by overriding the 2/3Vcc level of the voltage divider network. By applying a voltage to this pin the width of the output signal can be varied independently of the RC timing network. When not used it is connected to ground via a 10nF capacitor to eliminate any noise.

• Pin6. - Threshold, The positive input to comparator No 2. This pin is used to reset the Flip-flop when the voltage applied to it exceeds 2/3Vcc causing the output to switch from "HIGH"☐ to "LOW"☐ state. This pin connects directly to the RC timing circuit.

• Pin7. - Discharge, The discharge pin is connected directly to the Collector of an internal NPN transistor which is used to "discharge" the timing capacitor to ground when the output at pin 3 switches "LOW".

• Pin8. - Supply +Vcc, This is the power supply

**Astable Operation:**



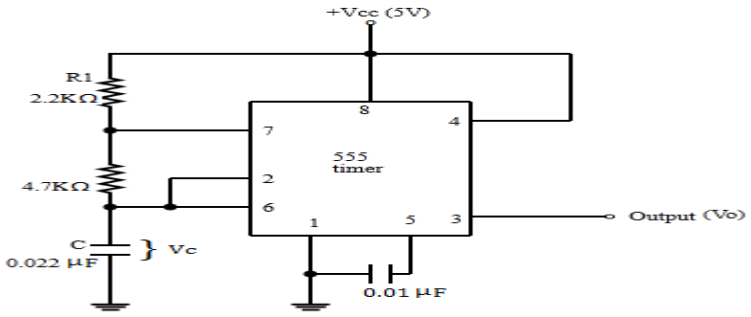




Fig. 1(a) : Circuit Diagram Fig. 1(b) : Circuit Diagram with Component values

One popular application of IC 555 is astable multivibrator. Fig. 1 shows astable circuit constructed using the external resistors and capacitor to set the timing of the output signal. The capacitor charges through resistors R1 and R2 the voltages across capacitor rises to 2VCC/3. This voltage acts as a threshold voltage at pin 6 which is input to internal comparator which finally trigger the internal flip flop so that output pin goes low. Also flip flop drives the internal discharge transistor to ON allowing capacitor to get discharge from R2 this lead to decrease in capacitor voltage to VCC/3 and the flip flop get trigger and discharge transistors gets off and output set to high. This leads to charging of capacitor through R1 and R2 to VCC.

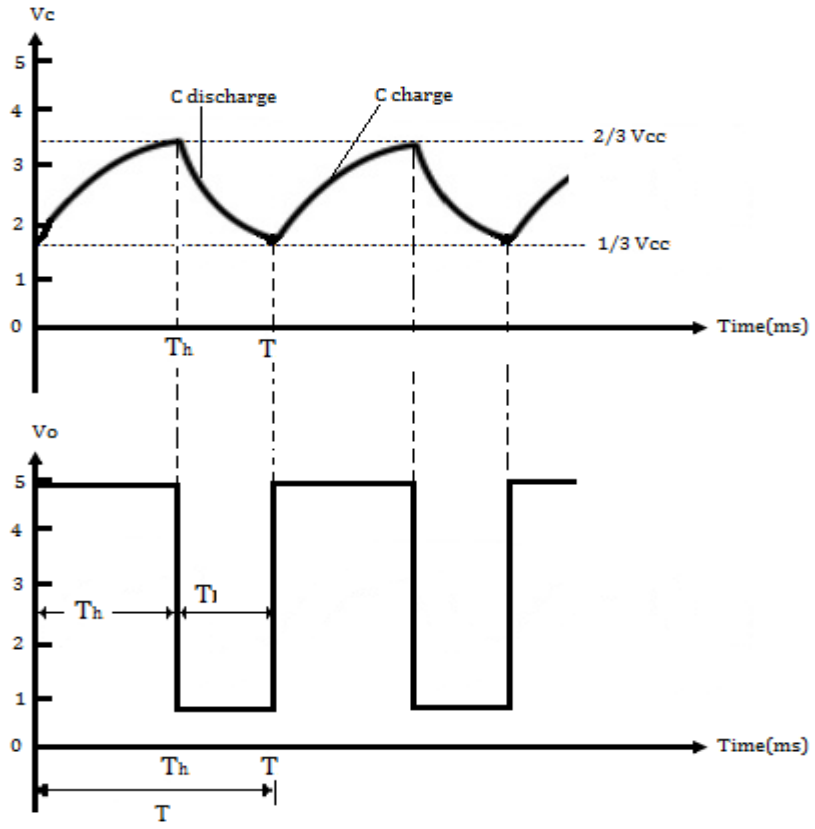



Fig. 2 : Astable Multivibrator Waveforms

The fig. 2 shows the waveforms associated with astable multivibrator. The calculation for the timing related to low and high output is given by The calculation for low and high has been as per the following equations

**TH = 0.7(R1 +R2)C**
**TL = 0.7R2C**
The total time T is given as,
**T = TH + TL**
The equation for total time interval T is given as

**T = (R1 + 2R2)C/1.44**

For the given values R1 = 2.2KΩ R2 = 4.7 KΩ and C= 0.022μF, frequency of operation will be 5.64 KHz and duty cycle will be 59.5%.

**Monostable Operation:**

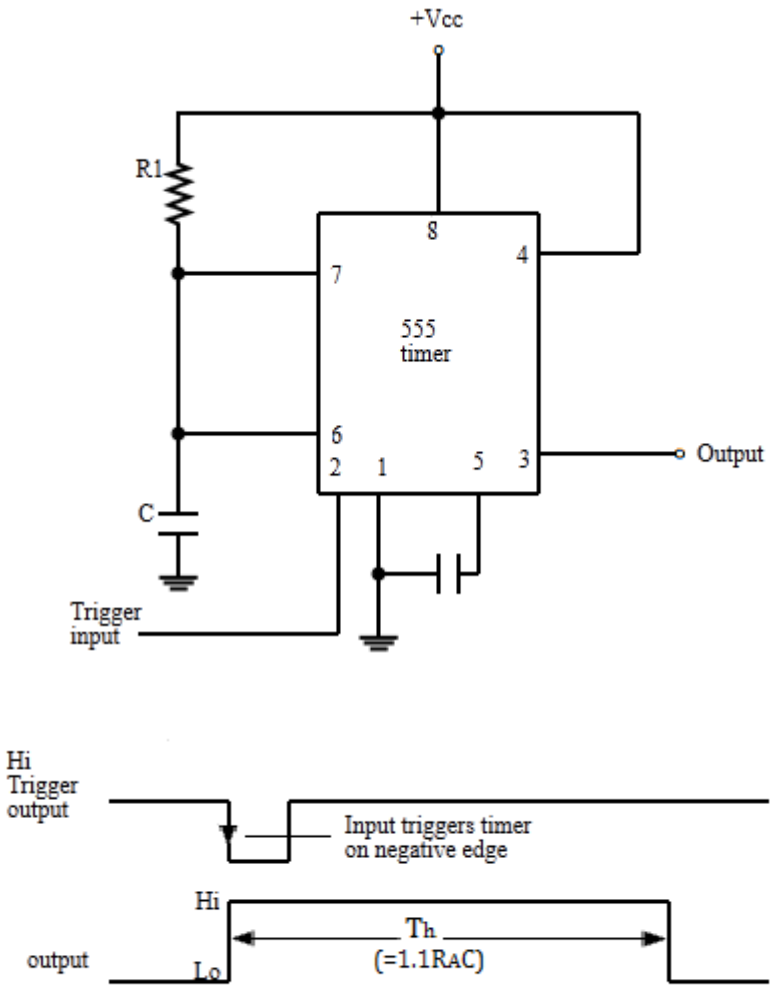



Fig. 3 : Monostable Multivibrator (a) : Circuit (b) : Waveforms

Timer IC 555 is also used as one shot or monostable operation. The circuit diagram is as shown in fig.3 Since there are many real life application where many applications needs to operate for only specific time interval for such application one shot or monostable operation is suitable. When negative going pulse is applied to pin 2 which leads to output pin 3 goes to high.

The time taken by

**TH=1.1 R1 C**

The negative edge of the trigger pulse causes the internal comparator 2 trigger the flip flops leads to output high at pin 3.The voltage across capacitor rises to 2VCC/3 through supply and resistor R1. When the voltage across capacitor reaches to 2VCC/3 the internal comparator 1 triggers the flip flop from and which send the output from high to low. Fig shows the waveforms associated with

the operation of the IC 555 as a monostable. The output waveform shows that the wide range from microsecond to many seconds can be possible with appropriate values of R1 and C. This flexibility of time period makes IC 555 versatile for many real life applications.

## 7. SUGGESTED BOOKS

**ICA LAB**

1. Linear Integrated Circuits-D. Roy Chowdhury, new Age international (p)Ltd, 3rd Edition, 2008.
2. Digital Fundamentals- Floyd and Jain,Pearson Education ,8th edition,2005.
3. Op-Amp & Linear Integrated Circuits-Concepts & Applications by James M.Fiore, Cengage / Jaico,2/e, 2009.

## 8. WEB SITES

1. http://nptel.iitm.ac.in/courses/117106030/
2. http://www.nprcet.org/e%20content/Misc/e-Learning/EEE/II%20YEAR/EE2254%20-%20Linear%20Integrated%20Circuits%20Applications.pdf
3. http://home.cogeco.ca/~rpaisley4/LM555.html
4. http://electronicsclub.info/555timer.htm
5. http://vol.verilog.com
6. http://nptel.ac.in/video.php?subjectId=106105083
7. www.sandeepani-training.com/
8. http://www.vectorindia.org/verilog.html
9. http://en.wikipedia.org/wiki/Verilog
10. http://www.verilog.com/
11. https://www.doulos.com/knowhow/verilog_designers_guide/
12. http://www.asic-world.com/verilog/veritut.html
13. http://www.altera.com/support/examples/verilog/verilog.html
14. http://www.electrosofts.com/verilog/
15. http://iverilog.com/

## 9. EXPERTS' DETAILS

**The expert details which have been mentioned below are only a few of the eminent ones known Internationally, Nationally and Locally.**

**INTERNATIONAL**

1. Mr.D.Roy Chowdhury, Ph.D. University of Michigan,Dept. of Electronics and Communication Engg.
2. Mrs. Azita Emami , Ph.D.California Institute of Technology, Professor of Electrical Engineering, Dept. of Electrical Engg.
3. Dr. Zainalabedin Navabi, Professor of Electrical and Computer Engineering, Worcesterm Polytechnic Institute, Worcester, e-mail: navabi@wpi.edu

**NATIONAL**

1. Prof.Roy Paily Palathinkal,Deptt. of Electrical Engg.,IIT Guwahati
2. Prof. Gaurav Trivedi, Deptt. of ECE, IIT, Guwahati.
3. Mr. R.K.Baruah, Tezpur University.
4. Dr. T. R. Padmanabhan, Professor of Computer Science and Engineering, Amrita School of Engineering, Coimbatore. e-mail: trp@amrita.edu
5. Dr. B. Bala Tripura Sundari, Associate Professor of Electronics and Communications Engineering, Amrita Vishwa Vidyapeetham University, Coimbatore. e-mail: b_bala@cb.amrita.edu

**REGIONAL**

1. Prof..Mr.K.Nageshwar Rao, Deptt. of ECE ,JITS,Warangal.
2. Dr.A.S Reddy, Principal, CMREC
3. Prof. C.Ashok Kumar, Depr. Of ECE, CMREC.
4. Dr. J. V. R. Ravindra, Professor Dept. of ECE, Vardhaman College of Engineering, Hyderabad. e-mail: jvr.ravindra@vardhaman.org

**10. (A) LAB SCHEDULE:** The lab schedule should be planned once in a week. The week wise Scheduled experiment should be completed.

**CYCLE 1 (For 30 students per session and 3 students per batch)**

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 | week-8 |
|---|---|---|---|---|---|---|---|---|
| B1, B2 | Demo | Exp.1 | Exp.2 | Exp.10 | Exp.9 | Exp.7 | Exp.8 | Lead1 |
| B3, B4 | Demo | Exp.2 | Exp.10 | Exp.9 | Exp.8 | Exp.1 | Exp.3 | Lead1 |
| B5, B6 | Demo | Exp.10 | Exp.9 | Exp.8 | Exp.1 | Exp.2 | Exp.7 | Lead1 |
| B7, B8 | Demo | Exp.9 | Exp.8 | Exp.1 | Exp.3 | Exp.10 | Exp.2 | Lead1 |
| B9, B10 | Demo | Exp.8 | Exp.1 | Exp.2 | Exp.7 | Exp.3 | Exp.10 | Lead1 |

**CYCLE 2(For 30 students per session and 3 students per batch)**

| **Batches** | **week-1** | **week-2** | **week-3** | **week-4** | **week-5** | **week-6** | week-7 | week-8 |
|---|---|---|---|---|---|---|---|---|
| B1, B2 | Exp.3 | Exp.4 | Exp.6 | Exp.11 | Exp.12 | Exp.5 | Hobby/lead2 | Test |
| B3, B4 | Exp.7 | Exp.6 | Exp.11 | Exp.12 | Exp.5 | Exp.4 | Hobby/lead2 | Test |
| B5, B6 | Exp.3 | Exp.11 | Exp.12 | Exp.5 | Exp.4 | Exp.6 | Hobby/lead2 | Test |
| B7, B8 | Exp.7 | Exp.12 | Exp.5 | Exp.4 | Exp.6 | Exp.11 | Hobby/lead2 | Test |
| B9, B10 | Exp.9 | Exp.5 | Exp.4 | Exp.6 | Exp.11 | Exp.12 | Hobby/lead2 | Test |

**(B) VIVA SCHEDULE:** The viva schedule should be planned prior starting to the lab experiment.

**ROUND -** 1

| **Batches** | **week-1** | **week-2** | **week-3** | **week-4** | **week-5** |
|---|---|---|---|---|---|
| B1,B2,B3 | viva | | | | |
| B1,B2,B3 | | Viva | | | |
| B1,B2,B3 | | | Viva | | |
| B1,B2,B3 | | | | Viva | |
| B1,B2,B3 | | | | | Viva |

**ROUND -** 2

| **Batches** | **week-1** | **week-2** | **week-3** | **week-4** | **week-5** |
|---|---|---|---|---|---|
| SG1 | viva | | | | |
| SG2 | | Viva | | | |
| SG3 | | | Viva | | |
| SG4 | | | | Viva | |
| SG5 | | | | | Viva |

*SG: Selected Group with a maximum of 6 or 12 students

**(C). SCHEME OF EVALUATION**

**LAB EXTERNAL**

| S no. | **Write-up ( by Internal examiner)** | **Final evaluation (Internal Examiner)** | **Viva (External Examiner)** |
|---|---|---|---|
| 1 | Aim<br>Equipment needed<br>Circuit diagram<br>Procedure<br>Precautions<br>Tabular form<br>Expected graph | Based on observation, how the student is connecting the circuit, usage of equipment and typical readings<br>And based on correctness of the practical graph to the expected graph and results. | Based on understanding of Experiment and theoretical questions in the related subject. |
| | **Marks: 30** | **Marks: 30** | **Marks: 15** |
| **Total Marks:30+30+15=75 Marks** | | | |

## LAB INTERNAL

| **Day to Day Evaluation ------ 15 Marks** | | | | | **Internal Exam ---10M Marks** | | |
|---|---|---|---|---|---|---|---|
| Uniform | Observation & Record | Performance of experiment | Result | Viva Voce | Write-up | Connections & Result | Viva Voce |
| **Marks:3** | **Marks:3** | **Marks:3** | **Marks:3** | **Marks:3** | **Marks:4** | **Marks:3** | **Marks: 3** |
| **Total Marks:15+10=25 Marks** | | | | | | | |

### 11. PROJECT/PRODUCT/PAPER BASED LEARNING

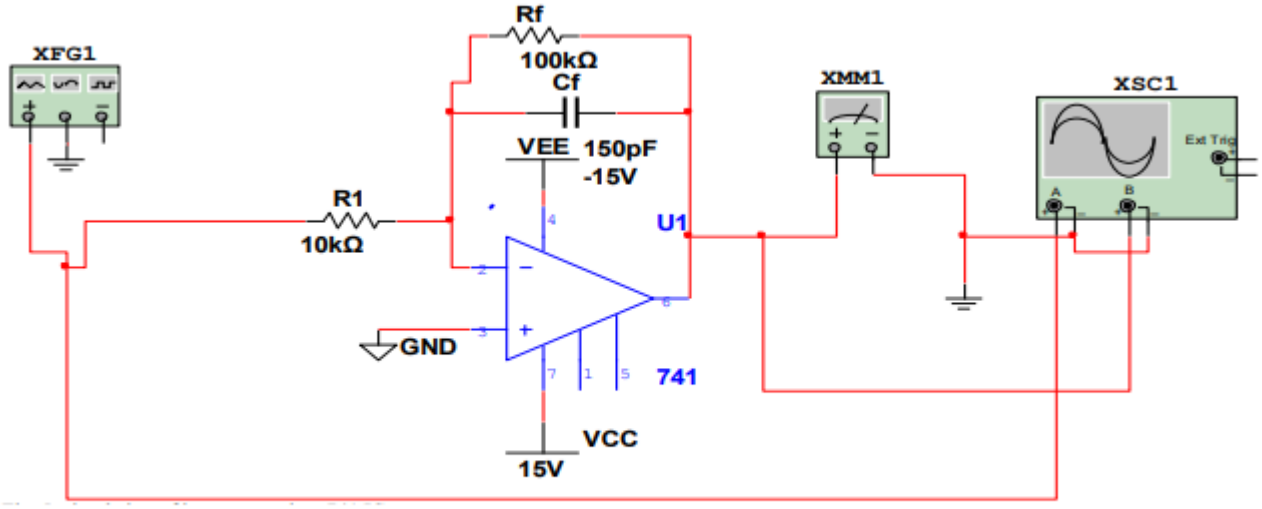
**Design and Simulation of VFA and CFA Based Integrator and Differentiator using Multisim and their Comparison**

**Abstract: -**

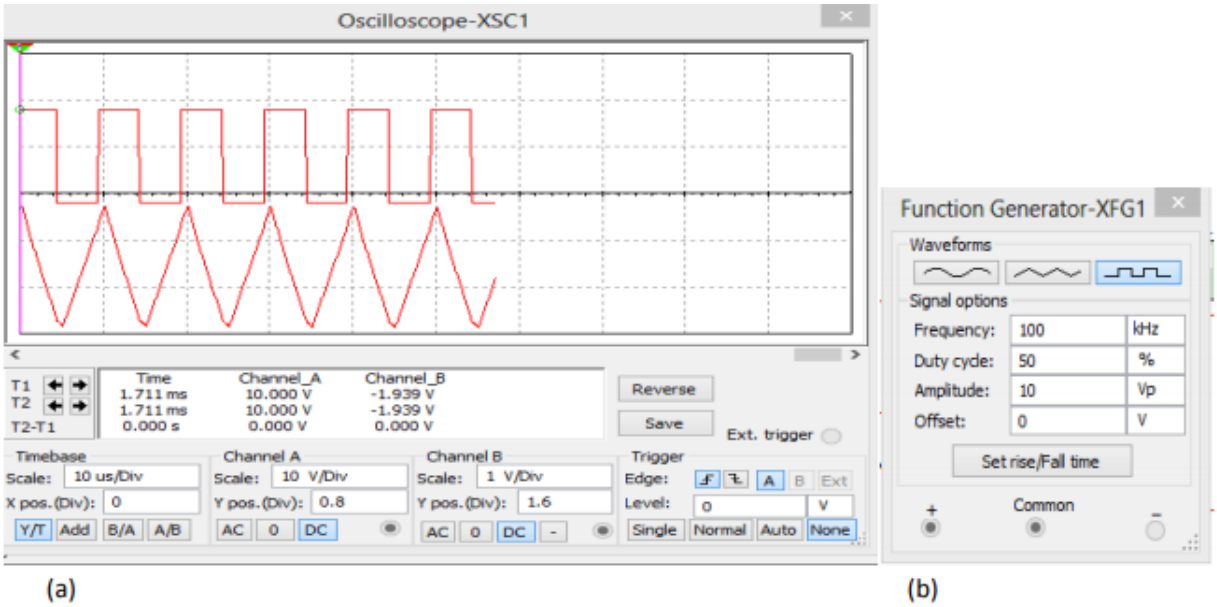
Voltage Feedback Amplifier(VFA) is used for most of the analog circuit design but in many high frequency applications like integrator and differentiator it's finite slew rate, finite gain bandwidth product limitation degrades its performance. Thus, the introduction of Current Feedback Amplifier(CFA) possessing a number of advantages including high slew rate due to its current feedback architecture, closed loop bandwidth that is independent of closed loop gain provides a new dimension to the use of analog circuitry at high frequency. In this paper, we present an analysis and comparison of the maximum frequency range of the inverting integrator and differentiator circuit using both CFA and VFA. We have utilized the pin-to-pin compatibility of CFA with VFA for designing CFA integrator/differentiator. An effort we has been made to design CFA circuits using VFA circuit configuration and at the same time selecting such component values, which gives maximum frequency range for the given circuits maintaining stability. The working capacity and the performance of the proposed circuits examined by simulating the circuits in NI multsim software using 741IC NI model for VFA and AD844 for CFA. These circuits are simulated at large signal, high frequency conditions which challenges their slew rate. Mathematical analysis for CFA topology is done to verify the slight circuit modifications required with CFA circuits. This comparison between older and new technology will be beneficial for the educational institutes in using higher speed op-amps in a simpler way replacing conventional ones.

Keywords: - Voltage-feedback amplifiers, Current Feedback Operational Amplifiers (CFOA),NI Muiltisim Simulation Software

**Simulation of Integrator using 741 IC:**




**Simulation Result:**




(a) Response of Integrator using IC 741 (b) Input using Function Generator

## 12. MAPPING OF LAB WITH PROJECT/CONSULTANCY/R & D:

The Integrated Circuit Applications Lab course should be designed in such a way that it should meet the requirements of research and development as well as consultancy projects. Also the Proposals of Project/R&D/Consultancy are as follows:

Proposal 1: Project Design & Execution

Proposal 2: R& D Level Project Design & Execution

Proposal 3: Consultancy Task / Project Design & Development.

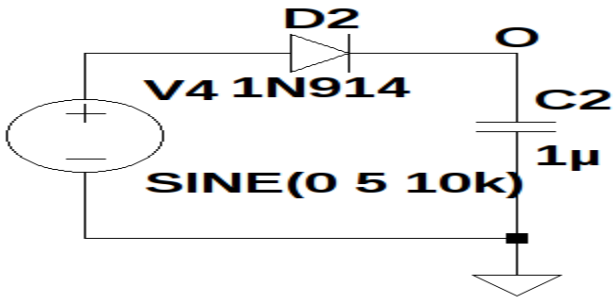
**PROPOSAL FOR PROJECT ACTIVITY:**

1. A Proposal of a hobby/mini/proto/general/model/proto type project with extended abstract, Block Diagram/Circuit/Flow diagram and clear references may be presented and executed.

**HOBBY PROJECT:**

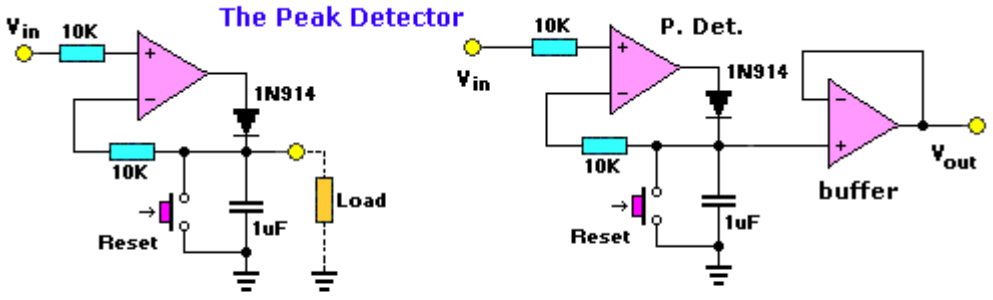
**Peak Detector:**

A peak detector is simply a circuit that traces the peaks in an input signal. You can make a simple peak detector without any op-amp, i.e., just by a diode and a capacitor. Since, you asked its construction using op-amp, I will stick to it. But before moving to the op-amp circuit, you must understand the flaw in the basic diode-capacitor circuit.




In this circuit, the input impedance is very low near the peaks of the input signal, which is undesirable. Also, the diode drop depends on the temperature and hence the output of the circuit can behave differently at different temperatures. The solution could be to somehow nullify this diode drop so that temperature dependency is no longer our concern. This could be achieved using op-amps.

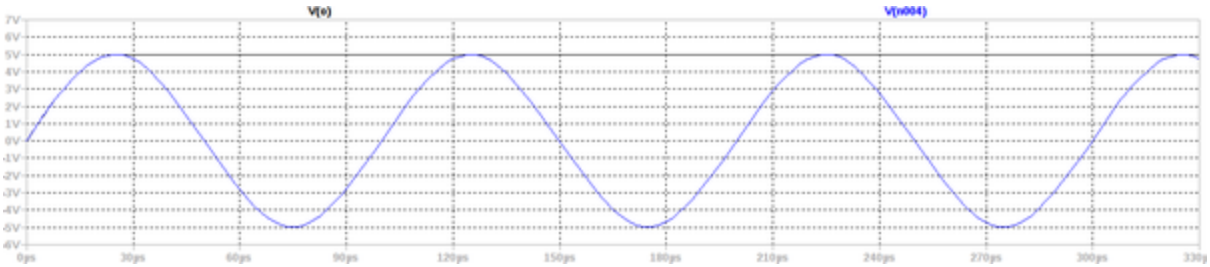
A peak detector with op-amp is shown below.




Design of op-amps with experiments

The input is V1 and the output is taken from node O. Just above the capacitor in the middle, there is a feedback from the node to the inverting terminal of the first op-amp. This is something that nullifies the diode drop.

The output of the circuit is shown below.




The black line is the output waveform which is tracing the peaks of input waveform (blue sine wave).

**FUNDED/ UNFUNDED PROPOSALS:**

The proposal for Two Weeks Embedded Systems Faculty Development Programme (FDP) under AICTE grants is applied and waiting for its approval.

## 13. GUIDELINES FOR SHADOW ENGINEERING (VIP) AND INDUSTRIAL VISITS (IIP – INNOVATIVE INDUSTRIAL LEARNING PROGRAM)

**OBJECTIVES OF SHADOW ENGINEERING:**

1. The program which uplifts the knowledge of the students related to laboratories.
2. To improve the industry-college interactions.
3. To create industry like environment for all the students in order to make future assignment.
4. This program leads to matrixing with the students.

**TABLE 1: INDUSTRIAL VISITS**

As of now no industrial visits is proposed.

| S. No | Type of industry | Nature of industry | Date of visit | No. of students participated | Year/branch | Remarks |
|---|---|---|---|---|---|---|
| 1 | Square Micro System | PCBs | | 60 | III/ECE | |

**TABLE 2: INDUSTRIAL TRAINING (Shadow Engg)**
**(Career Visit Approval)**

| S.no | Name of the Course | Nature of industry | Duration of Training | Authority | Date of Training/ Certificate No. | Remarks |
|---|---|---|---|---|---|---|
| 1 | IC Design | CDAC | | | | |

**14. ACTIVITIES IN LIFT PROGRAMME**:

**CALIBRATION/INSTALLATION AND TESTING:**

Calibration: Aim of this concept is to check:

i. whether all the equipment is functioning correctly as per the standards
ii. To bring correctness in the errors of instrument or equipment.
iii. To rectify the errors if any

Installation: Aim of this concept is to make and maintain installation procedure for a New equipment or already existing equipment

Testing : Aim of this concept is to test the equipment after installation whether it Meets the existing standards.

The list of equipments (hardware/software):

Necessity of tools for development and testing.
Equipment to be calibrated.
Installation of supporting equipment if any.

**PROCEDURE FOR CALIBRATION**:

Any Equipment or Instrument or Gauge or Machine can be calibrated as the standard guidelines mentioned under:

1. Identify the Equipment/Instrument/Gauge/Machine which is under defective or to be calibrated or correction for error
2. Identify the type of error and estimate its frequency of variation.
3. Check with Master Standards or equipment/instrument/machine which is working correctly and meeting our requirements.
4. Estimate the frequency of deviations from normal mode.
5. If the equipment is under warranty, then inform to concerned supplier or agency that will carry out calibration.

6. If the equipment is out of warranty then we can compare the deviations and set the error rectification.
7. Generally as per the procedure, the equipment or instruments can be calibrated by the agencies and issue calibration certificate which consists of date of calibration, calibration next due date and remarks as mentioned in the following format.
8. Record and keep all the calibration certificates in safe custody.

**After calibration the details of equipment should be submitted in following format.**

| S.no | Type of equipment | Certificate no | Certificate issued by | Date of calibration | Date of calibration due | Remarks |
|---|---|---|---|---|---|---|
| 1 | Cathode ray Oscilloscope | | SS Instruments, Kukatpally | | | |
| 2 | Trainer Kits | | SS Instruments, Kukatpally | | | |

**iv. Calibration, Testing and Installation details equipment wise are mentioned as follows:**

Case 1: Calibration of Equipment ---------- if any

Case 2: Installation of Equipment ---------- if any

Case 3: Testing of Equipment ---------- if any

Presently there is no new equipment is present for either testing or installations**.**

## 15. MAINTAINANCE AND TROUBLESHOOTING:

**Maintenance:**

Maintenance and trouble shooting of each equipment in a laboratory must follow the following guidelines:

Maintenance Schedules:

(1) Preventive Maintenance Schedules of lab will be decided by lab in charge along with concerned HOD. The details of schedule should be recorded in the following template of format.

| S.No. | Name of the Equipment | Date of Maintenance | Type of Activity | Remarks |
|---|---|---|---|---|
| 1 | Cathode ray Oscilloscope | | Cleaning and Servicing | Working well |
| 2 | Trainer Kits | | Testing and | Working OK |

| | | | | |
|---|---|---|---|---|
| | | | Troubleshooting | |
| 3 | Power Supply's | | Testing and Troubleshooting | Working OK |
| 4 | Multi-meters | | Error Correction and Calibration | Working OK |

**(2)** Maintenance Reports duly signed by in charges as well as HODs and duly approved by Principal periodically.

**TROUBLE SHOOTING SCHEDULES:**

A proposal is to be made from each lab branch wise. The proposal should carry following details related to specific equipment in lab.

S.No., Equipment Name , Type of Problem (Too much Noise, Abnormal Sound, Corrupt Software, Anti Virus Problem, Missing of Display, CRT not working, Motor is not giving signal, Digital display is not working, Break of tools, Mis alignment of machine elements, PLC is not properly working), Expected Reasons ( Bearing failure, Improper alignment of machine centres, Missing of vibration pads etc)

Trouble shooting exercises should be properly recorded in a separate format as mentioned below:

| **S.No.** | **Date of recording activity** | **Equipment Name** | **Type of Trouble** | **Remedial Activity** | **Remarks** |
|---|---|---|---|---|---|
| | | | | | |

**16. ASSESSMENT AND ACCREDITATION PROCESDURE AS PER NABL**

Accreditation is the formal recognition, authorization and registration of a laboratory that has demonstrated its capability, competence and credibility to carry out the tasks. It provides the feedback to laboratories as to whether they are performing according to technical competence as per guidelines of NABL (National Accreditation Board for Testing and Calibration Laboratories)

The laboratory should carry out the following important tasks towards getting ready for accreditation from NABL.

1. Preparation of methodology in each experiment.
2. Preparation of Standard Operating procedure for each equipment
3. Preparation of Laboratory Manual as per the guidelines specified by Combined Lab Team(CLT) headed by Principal/HOD/Dean/ in charge
4. Ensure Effective environmental conditions (temperature, humidity, storage and placement) in the laboratories by implementing proper housekeeping and cleaning of the equipments from dust, dirt etc.

5. Ensure Calibration of instruments/equipment (Only NABL accredited authorized laboratories provide calibration.
6. All the details of Calibration should be included in the format specified exclusively for calibration procedure.
7. Ensure proper implementation of all the documents, formats to be included in the lab manual.
8. Impart training for all the technicians working in labs about the importance of documentation, log sheets, operating procedure of the lab.
9. Incorporate Internal Lab audits for effective functioning of the laboratories. Audits may be once in a month or 3 months or at the end of the semester. The audit schedule will be decided by the Chairman and Principal of the CLT team.
10. Auditors should submit the detailed report of each lab duly signed to the Principal.
11. Each lab should maintain all the bills/invoices of each instrument or equipment in a separate file.
12. All the stock registers either consumable or non consumable should be updated whenever any purchases of consumables or equipment takes place.
13. All the safety precautions are properly displayed in front of each lab.
14. All the Lead experiments should be maintained separately in a record /record in a separate folder.
15. Based on Pre Assessment report submitted by auditor, corrective actions should be carried out by each lab in charge and that must be forwarded to concerned HOD and Principal.

## SUBJECTWISE LAB PLANNER

## DIGITAL IC APPLICATIONS LAB

**CONTENTS:**

## 1. OBJECTIVES AND RELEVANCE

The main objective of the lab course is to gain practical hands on experience by exposing the students to Design various Digital circuits like Encoders, Multiplexer, Adders, Sustractors, Shift Registers, converters, comparators, counters is to be performed.

**2.SCOPE**

Understanding of Digital IC Aplications lab has the scope to make the learner comfortable to work in the area of Digital systems and also to implement various Digital IC Applications like Memory Chips, Calculators, Sensors, Converters

**3.PREREQUISITES**

Theoretical knowledge on subject Linear and Digital IC Applications is required.

**PART - A**

**PREAMBLE**

This lab covers the experiments in Linear and Digital IC Applications subject. The JNTUH has given 15 experiments in the syllabus out of which twelve experiments are compulsory.

## 4. SYLLABUS-JNTUHH

**UNIT-I**

**EXPERIMENT NO. 1**

Design and Implementation of 16X4 Priority Encoder Using 8X3 Priority Enoder.

(JNTUH SL.No.1)

**OBJECTIVE**

To Design a 16X4 Priority Encoder using 8X3 Priority Encoder.

**PREREQUISITES**

Basic knowledge of Logic Gates, K-map and IC 74LS148 and IC 4011 is required.

**DESCRIPTION**

a. Introduction to experiment -30 min.
b. Connection of experiment and its verifications

**APPLICATIONS**

1. Key Boards
2. Navigation.
3. Magnetic Positional Control

**EXPERIMENT NO. 2**

Design and Implementation of 16 bit Comparator using 4 Bit Comparators.

(JNTUH SL.No.2)

**OBJECTIVE**

To Design of 16 bit Comparator using 4 Bit Comparators.

**PREREQUISITES**

Basic knowledge of Logic Gates, K-map and IC 74LS85 is required.

**DESCRIPTION**

a. Introduction to experiment -30 min.

b. Connection of experiment and its verifications

**APPLICATIONS**

**1.** Microprocessor based Devices
**2.** Control Applications,
**3.** Process Controllers
**4.** Servo motor Control

**EXPERIMENT NO.3**

Design and Implementation of Model to 53 Counter using two Decade Counters.

(JNTUH SL.No.3)

**OBJECTIVE**

To Design of Model to 53 counter using two Decade Counters.

**PREREQUISITES**

Basic knowledge of Logic Gates, K-map ,D- flipflop and IC 74LS90 is required.

**DESCRIPTION**

a. Introduction to experiment -30 min.

b. Connection of experiment and its verifications

**APPLICATIONS**

1. Clock generation
2. Clock division
3. Integrated oscillator
4. Low power cmos
5. TTL compatible inputs
6. In frequency counting circuits

**EXPERIMENT NO.4**

Design And Implementation of a 450 KHz clock using NAND / NOR gates.

(JNTUH SL.No.4)

**OBJECTIVE**

To Design of a 450 KHz clock using NAND / NOR gates.

**PREREQUISITES**

Basic knowledge about digital logic gates and their operation.

**DESCRIPTION**

a. Introduction to experiment -30 min.

b. Connection of experiment and its verifications

**APPLICATIONS**

1. Signal processing
2. Digital communications

**EXPERIMENT NO. 5**

Design and Implementation of 4 bit pseudo random sequence generator using 4 bit ring counter

(JNTUH SL.No.5)

**OBJECTIVE**

To Design of 4 bit pseudo random sequence generator using 4 bit ring counter

**PREREQUISITES**

Basic knowledge about digital logic gates ,IC 7474, IC 74136 and their operation

**DESCRIPTION**

a. Introduction to experiment -30 min.

b. Connection of experiment and its verifications

**APPLICATIONS**

1. Computer Graphics
2. Cryptography
3. Automatic Systems

**EXPERIMENT NO. 6**

Design and Implementation of 16 x 1 Multiplexer using 8 x 1 Multiplexer.
(JNTUH SL.No.6)

**OBJECTIVE**

To Design of 16 x 1 Multiplexer using 8 x 1 Multiplexer. (JNTUH SL.No.6)

**PREREQUISITES**

Basic knowledge about digital logic gates ,IC 74151, IC 74157 and their operation

**DESCRIPTION**

a. Introduction to experiment -30 min.
b. Connection of experiment and its verifications

**APPLICATIONS**

1. Communication Systems
2. Telephone Networks
3. Computer Memory

**EXPERIMENT NO.7**

To Design and Implementation of 16 bit Adder/Subtractor using 4 bit Adder/ Subtractor IC's.
(JNTUH SL.No.7)

**OBJECTIVE**

To Design of 16 bit Adder/Subtractor using 4 bit Adder/ Subtractor IC's.

**PREREQUISITES**

Basic knowledge about digital logic gates ,IC 7483 and their operation

**DESCRIPTION**

a. Introduction to experiment -30 min.
b. Connection of experiment and its verifications

**APPLICATIONS**

1. Digital Computers
2. Digital communications

**EXPERIMENT NO.8**

To Plot the Transform Characteristics of 74H,LS,HS series IC's
(JNTUH SL.No.8)

**OBJECTIVE**

Plot the Transform Characteristics of 74H,LS,HS series IC's

**PREREQUISITES**

Basic knowledge of 74H, LS, HS series IC's .

**DESCRIPTION**

a. Introduction to experiment -30 min.

b. Connection of experiment and its verifications

c. Plot the Characteristics of Different IC's

**APPLICATIONS**

1. Communication Systems
2. Telephone Networks
3. Computer Memory
4. Computer Graphics
5. Cryptography
6. Automatic Systems

And Many more

**EXPERIMENT NO.9**

To Design and Implementation of 4 bit Gray to Binary and Binary to Gray Converter.

(JNTUH SL.No.9)

**OBJECTIVE**

To Design of 4 bit Gray to Binary and Binary to Gray Converter.

**PREREQUISITES**

Basic knowledge about digital logic gates ,IC 74136 and their operation.

**DESCRIPTION**

a. Introduction to experiment -30 min.
b. Connection of experiment and its verifications

**APPLICATIONS**

1. Position encoders
2. Mathematical Puzzles
3.Genetic algorithms
4. Error Correction

**EXPERIMENT NO. 10**

To Design and Implementation of a two Digit 7 segment Display unit using this display the mod counter output of experiment 3. (JNTUH SL.No.10)

**OBJECTIVE**

To Design of a two Digit 7 segment Display unit using this display the mod counter output.

**PREREQUISITES**

Basic knowledge of digital logic gates ,IC 7490 and their operation

**DESCRIPTION**

a. Introduction to experiment -30 min.
b. Connection of experiment and its verifications

**APPLICATIONS**

1. Frequency counter
2. Digital clocks
3. A/D converters
4. Display units

**EXPERIMENT NO. 11**

To Design and Implementation of a 8 bit Parallel load and Serial out shift register using two 4 bit shift registers**.** (JNTUH SL.No.11)

**OBJECTIVE**

To Design of a 8 bit Parallel load and Serial out shift register using two 4 bit shift registers

**PREREQUISITES**

Basic knowledge of digital logic gates ,IC 7474 and their operation.

**DESCRIPTION**

a. Introduction to experiment -30 min.
b. Connection of experiment and its verifications

**APPLICATIONS**

a) Temporary data storage
b) Data transfer
c) Data manipulation
d) As counters.

**EXPERIMENT NO. 12**

To Design and Implementation of a 8 bit Serial in and Serial out shift register using two 4 bit shift registers**.** (JNTUH SL.No.12)

**OBJECTIVE**

To Design of a 8 bit serial in and Serial out shift register using two 4 bit shift registers

**PREREQUISITES**

Basic knowledge of digital logic gates ,IC 7474 and their operation.

**DESCRIPTION**

a. Introduction to experiment -30 min.
b. Connection of experiment and its verifications

**APPLICATIONS**

a) Temporary data storage
b) Data transfer
c) Data manipulation
d) As counters.

**EXPERIMENT NO. 13**

To Design and Implementation of a Ring Counter and Twisted ring counter using 4 bit shift registers**.** (JNTUH SL.No.13)

**OBJECTIVE**

To Design of a Ring Counter and Twisted ring counter using two 4 bit shift registers

**PREREQUISITES**

Basic knowledge of digital logic gates ,IC 7474 and their operation.

**DESCRIPTION**

a. Introduction to experiment -30 min.
b. Connection of experiment and its verifications

**APPLICATIONS**

a) Temporary data storage
b) Data transfer
c) Data manipulation
d) As counters.

**EXPERIMENT NO.14**

To Design and Implementation of a 4 bit Hex counter using synchronous one digit Hex counter . (JNTUH SL.No.14)

**OBJECTIVE**

To Design of a 4 bit Hex counter using synchronous one digit Hex counter

**PREREQUISITES**

Basic knowledge of digital logic gates ,IC 74193 and their operation

**DESCRIPTION**

a. Introduction to experiment -30 min.

b. Connection of experiment and its verifications

**APPLICATIONS**

a) Machine motion control.
b) Alarm clock
c) Flashing Indicater

**EXPERIMENT NO. 15**

To Design and Implementation of a 4 bit Hex counter using Asynchronous one digit Hex counter .

(JNTUH SL.No.15)

**OBJECTIVE**

To Design of a 4 bit Hex counter using Asynchronous one digit Hex counter

**PREREQUISITES**

Basic knowledge of digital logic gates ,IC 74193 and their operation

**DESCRIPTION**

a. Introduction to experiment -30 min.

b. Connection of experiment and its verifications

**APPLICATIONS**

a) Asynchronous counters are used as frequency dividers, as divide by N counters.
b) These are used for low power applications and low noise emission.
c) These are used in designing asynchronous decade counter.
d) Also used in Ring counter and Johnson counter.
e) Asynchronous counters are used in Mod N ripple counters. EX: Mod 3, Mod 4, Mod 8, Mod 14, Mod 10 etc.

**5. LEAD EXPERIMENTS**

**EXPERIMENT NO. 1**

1. Design and implementation of BCD to Excess 3 code conversion using NAND gates

**OBJECTIVE**

To Design of BCD to Excess 3 code conversion using NAND gates

**PREREQUISITES**

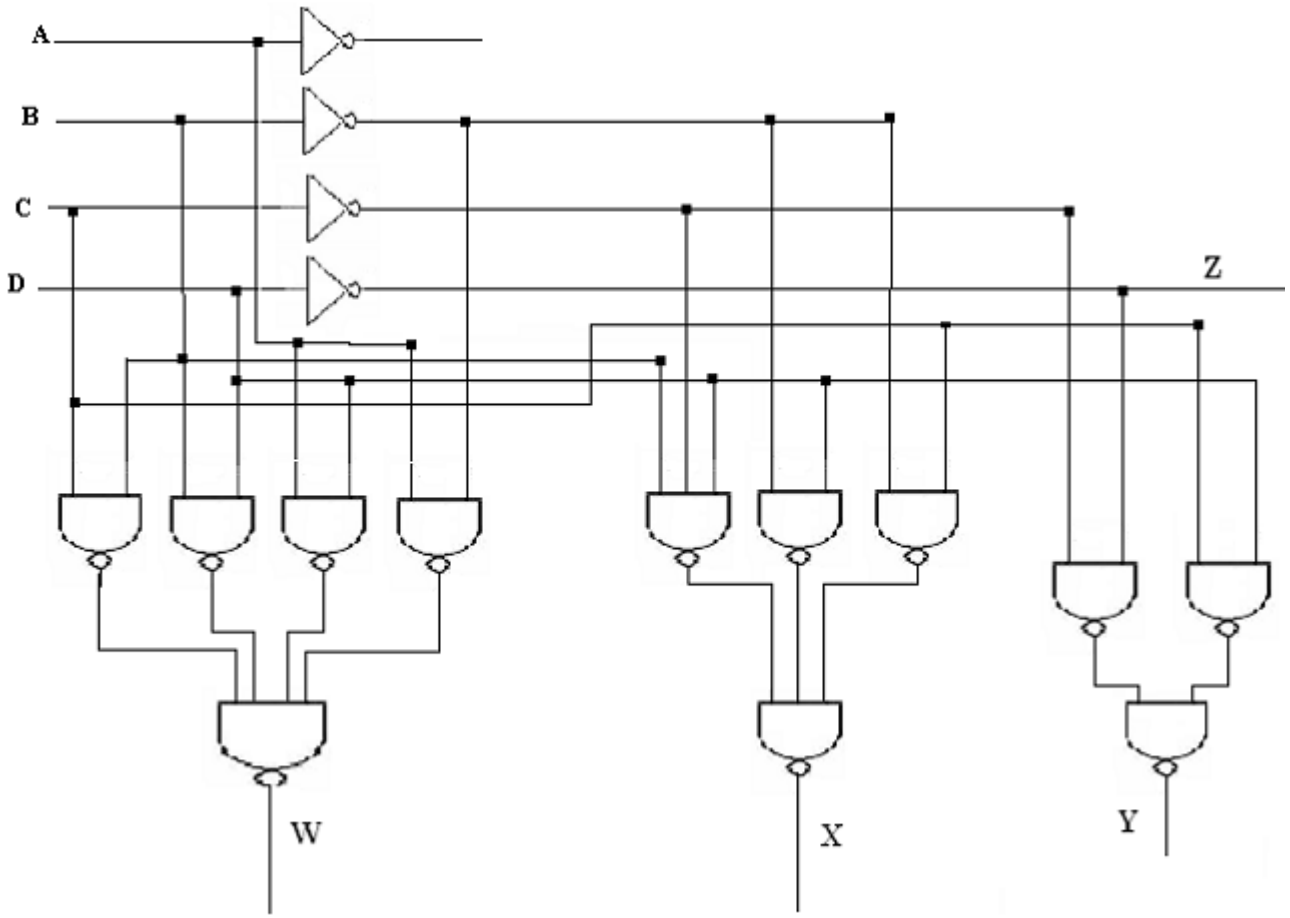
Basic knowledge of digital logic gates ,IC 4011 and their operation

**DESCRIPTION**

a. Introduction to experiment -30 min.

b. Connection of experiment and its verifications

**LOGIC DIAGRAM:**




**APPLICATIONS**

1. Position encoders
2. Mathematical Puzzles
3.Genetic algorithms
4. Error Correction

**EXPERIMENT NO. 2**

Design and implementation of 4 to 16 decoder using 3 to 8 decoder

**OBJECTIVE**

Design of 4 to 16 decoder using 3 to 8 decoder

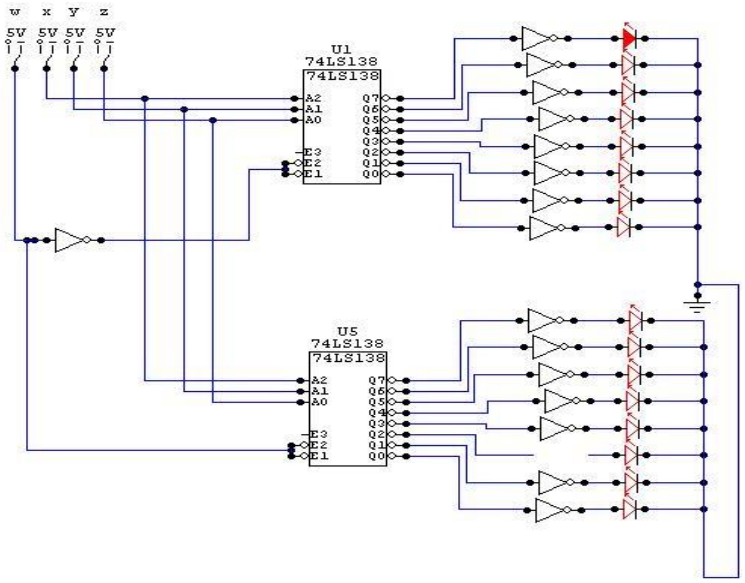
## PREREQUISITES

Basic knowledge of digital logic gates ,IC 74138 and their operation

## DESCRIPTION

a. Introduction to experiment -30 min.
b. Connection of experiment and its verifications

## LOGIC DIAGRAM:




## TRUTH TABLE:

| Inputs | | | | Outputs | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | $Y_0$ | $Y_1$ | $Y_2$ | $Y_3$ | $Y_4$ | $Y_5$ | $Y_6$ | $Y_7$ | $Y_8$ | $Y_9$ | $Y_{10}$ | $Y_{11}$ | $Y_{12}$ | $Y_{13}$ | $Y_{14}$ | $Y_{15}$ |
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |

## APPLICATIONS

1. Binary to Decimal Decoders
2. Address Decoder
3. Instruction Decoder

# 6. VIRTUAL LAB EXPERIMENT:

## Simulation Using Ptoteus

### About Proteus

It is a software suite containing **schematic**, **simulation** as well as **PCB designing**.

- **ISIS** is the software used to draw schematics and simulate the circuits in real time.The simulation allows human access during run time,thus providing real time simulation.
- **ARES** is used for PCB designing.It has the feature of viewing output in 3D view of the designed PCB along with components.
- The designer can also develop 2D drawings for the product.

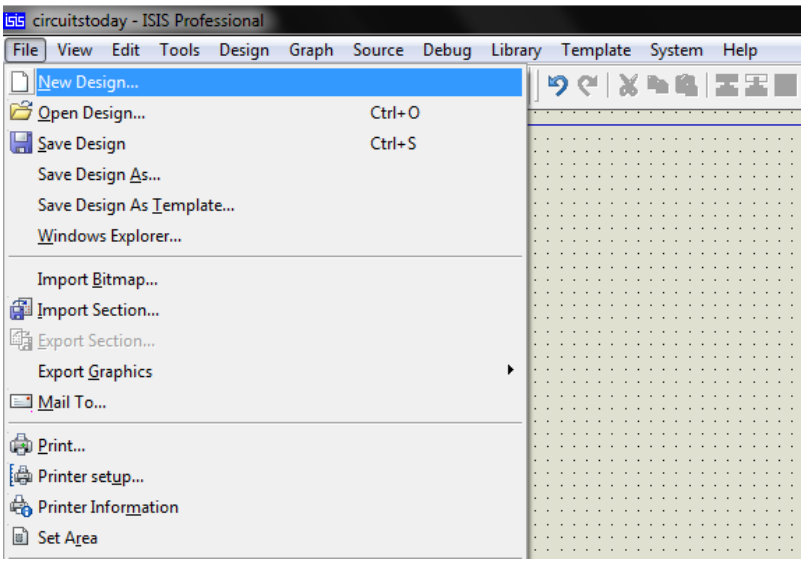
### Features

ISIS has wide range of components in its library. It has sources, signal generators, measurement and analysis tools like **oscilloscope**, voltmeter, ammeter etc., probes for real time monitoring of the parameters of the circuit, **switches**, **displays**, loads like motors and lamps, discrete components like resistors, capacitors, inductors, transformers, digital and analog Integrated circuits, semi-conductor switches, relays, microcontrollers, processors, sensors etc.

ARES offers PCB designing up to 14 inner layers, with surface mount and through hole packages. It is embedded with the foot prints of different category of components like ICs, transistors, headers, connectors and other discrete components. It offers Auto routing and manual routing options to the PCB Designer. The schematic drawn in the ISIS can be directly transferred ARES.

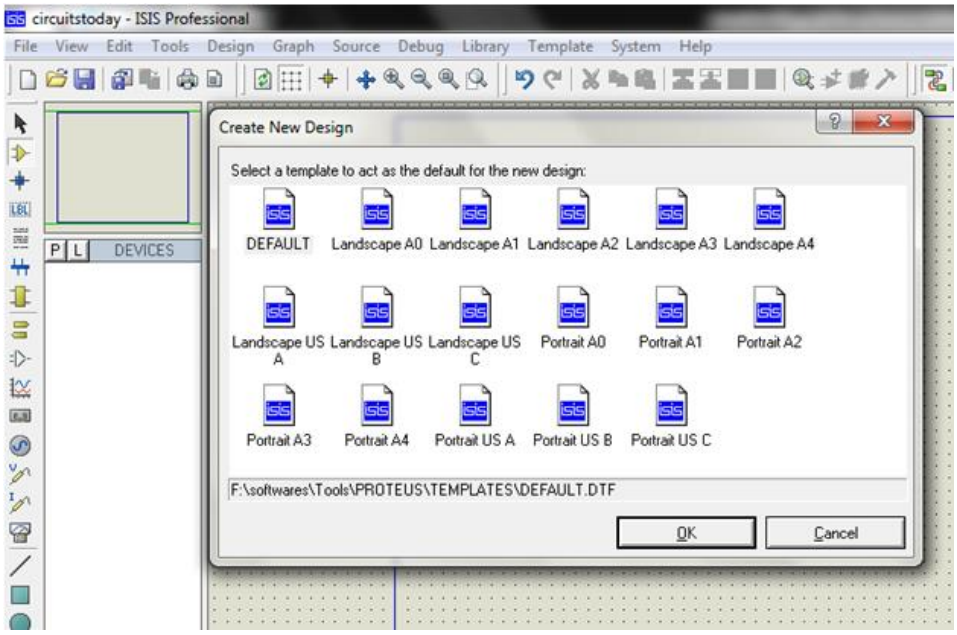
### Starting New Design

**Step 1**: Open ISIS software and select New design in File menu



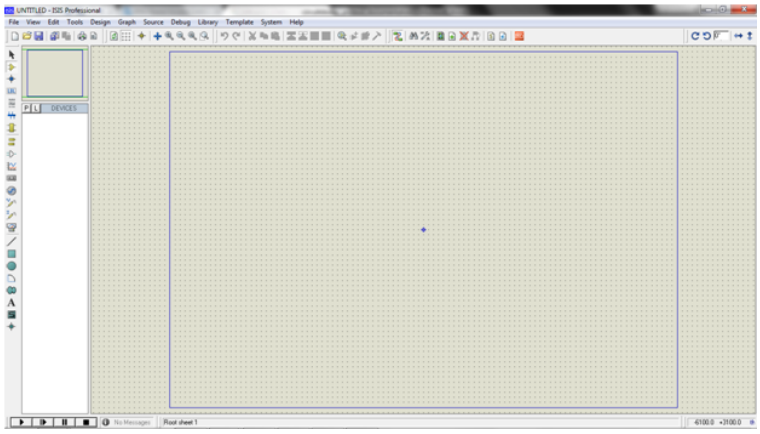

Proteus File Menu

**Step 2**: A dialogue box appears to save the current design. However, we are creating a new design file so you can click Yes or No depending on the content of the present file. Then a Pop-Up appears asking to select the template. It is similar to selecting the paper size while printing. For now select default or according to the layout size of the circuit.



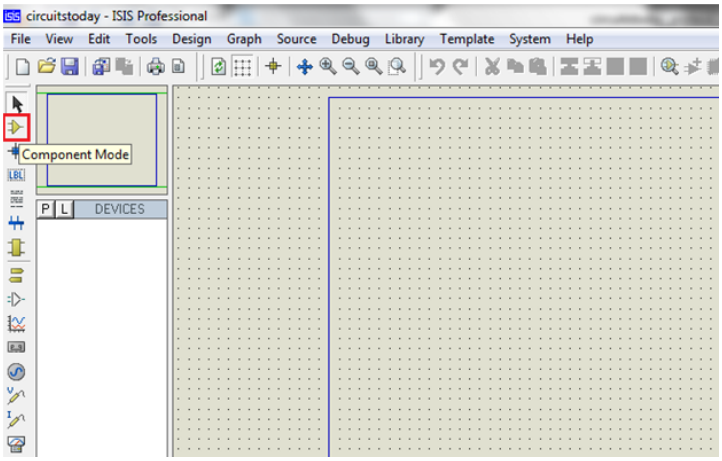

Proteus Default Template Select

**Step 3**: An untitled design sheet will be opened, save it according to your wish,it is better to create a new folder for every layout as it generates other files supporting your design. However,it is not mandatory.



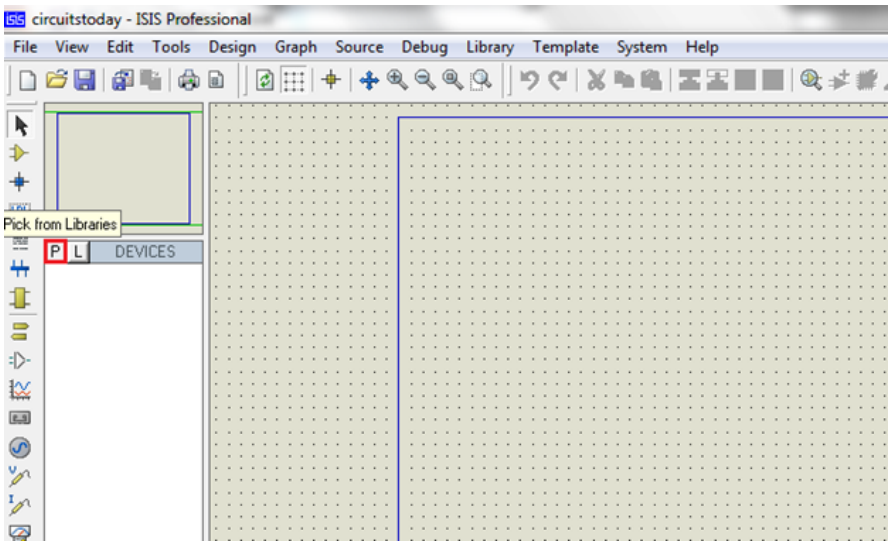
Proteus Design Sheet

**Step 4**:To Select components, Click on the component mode button.



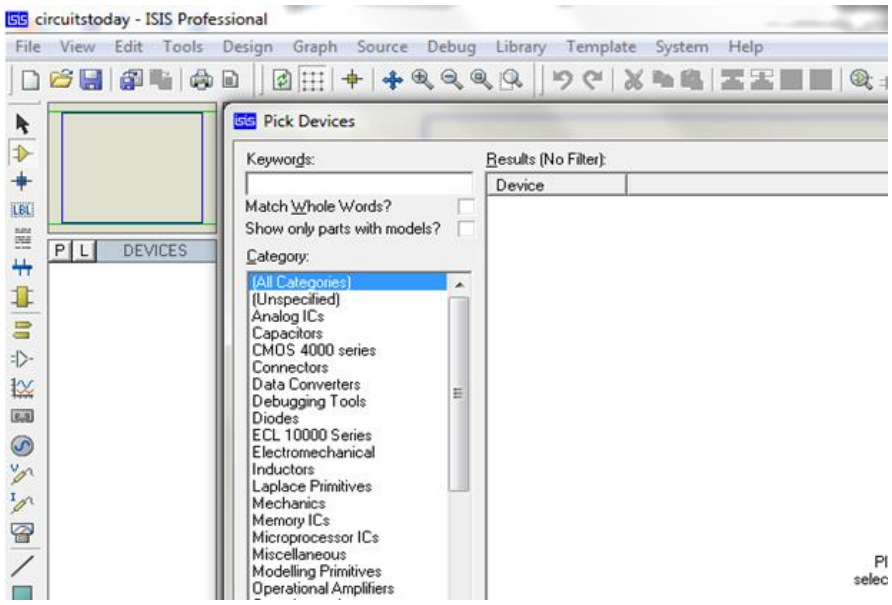

Component Mode

**Step 5**:Click On Pick from Libraries. It shows the categories of components available and a search option to enter the part name.



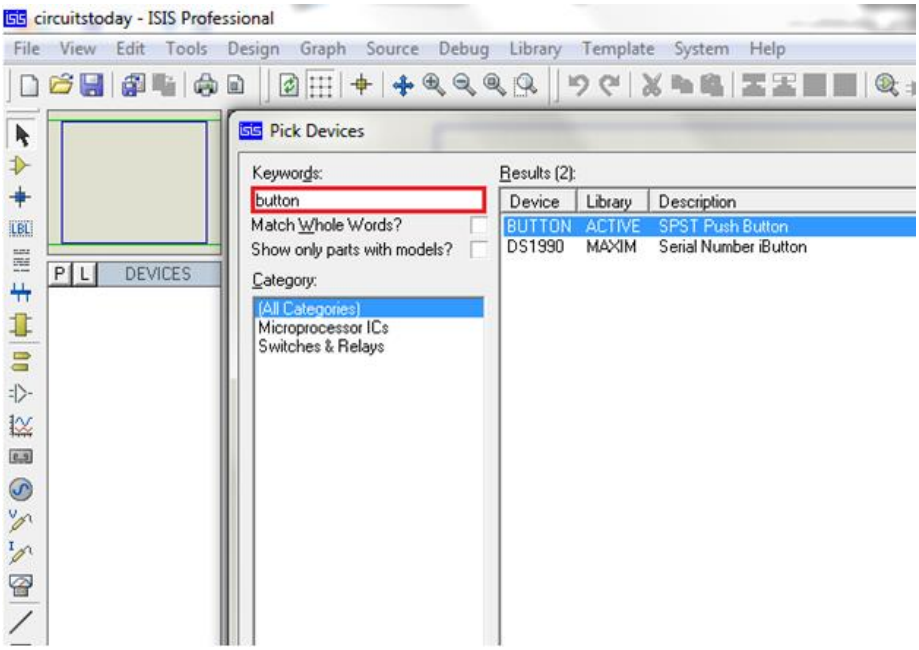

Pick from Libraries

**Step 6**: Select the components from categories or type the part name in Keywords text box.



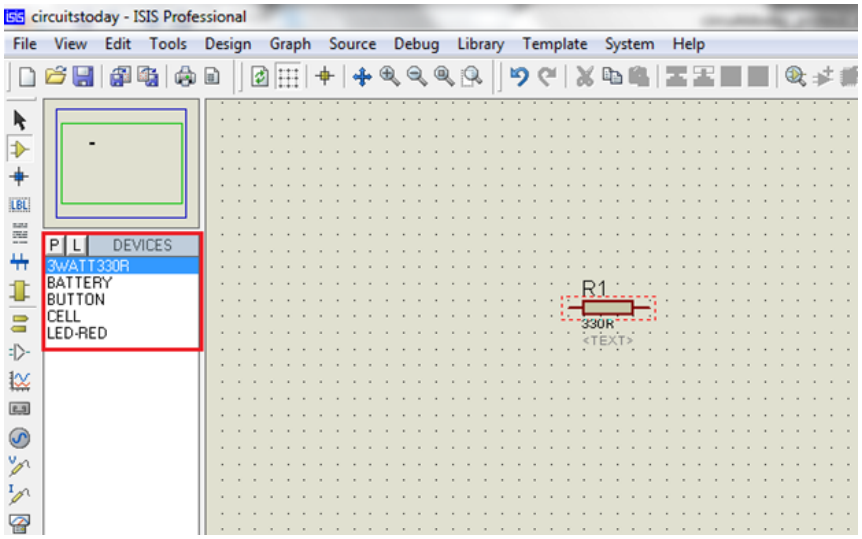

Keywords Textbox

Example shows selection of push button. Select the components accordingly.




Push Button Selection

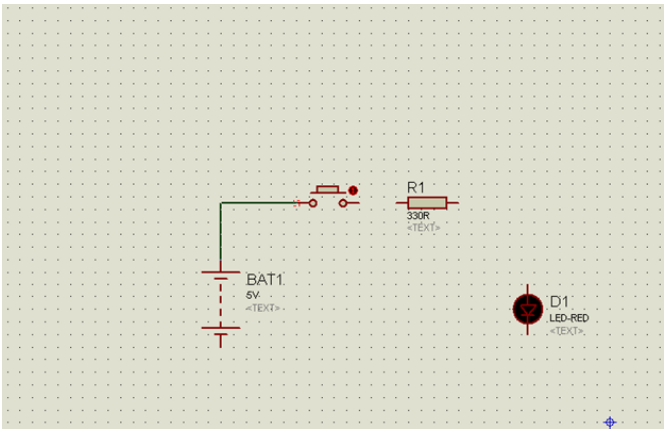
**Step 7**: The selected components will appear in the devices list. Select the component and place it in the design sheet by left-click.




Component Selection

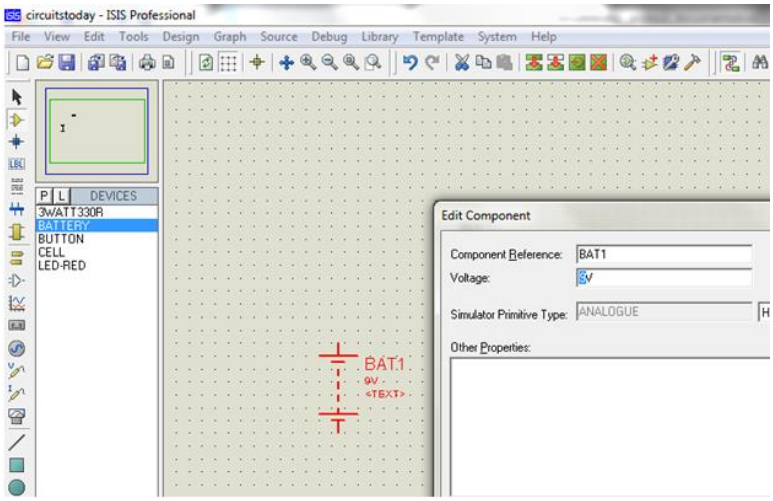
Place all the required components and route the wires i.e, make connections.

Either selection mode above the component mode or component mode allows to connect through wires. Left click from one terminal to other to make connection. Double right-click on the connected wire or the component to remove connection or the component respectively.



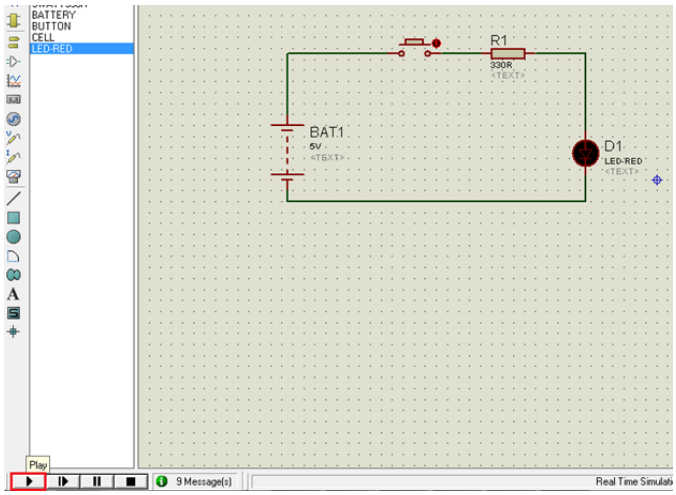

Component Properties Selection

Double click on the component to edit the properties of the components and click on Ok.



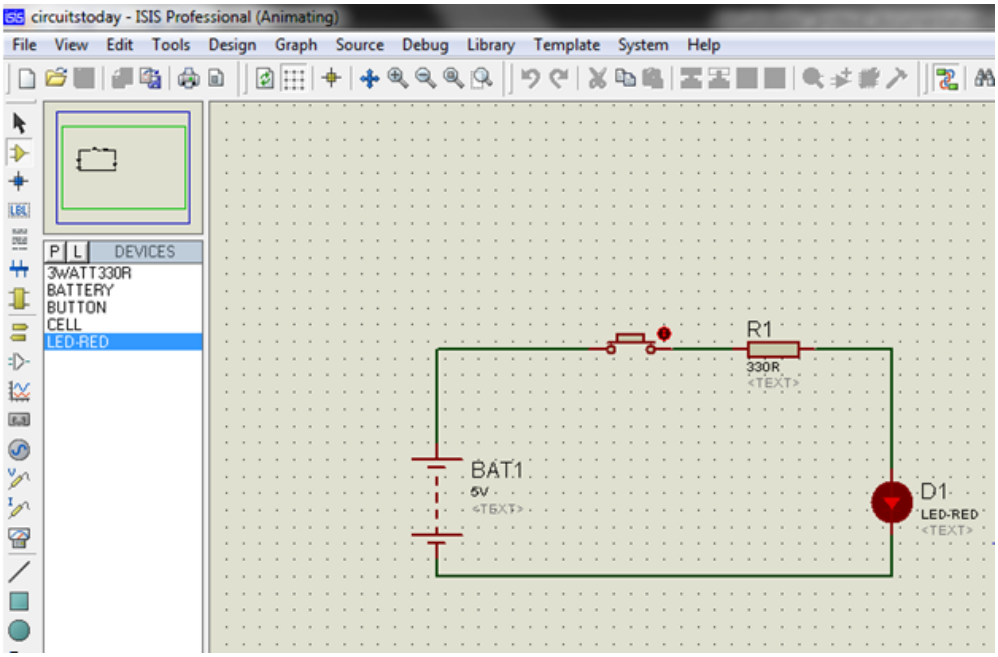

Component Properties Edit

**Step 8:** After connecting the circuit,click on the play button to run the simulation.



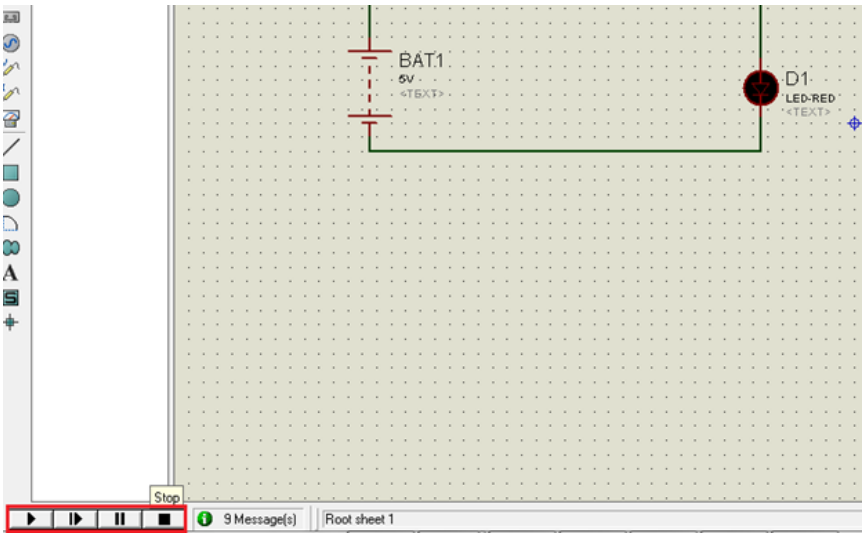

Simulation Run

In this example simulation, the button is depressed during simulation by clicking on it to make LED glow.




Simulation Animating

Simulation can be stepped, paused or stopped at any time.




Simulation Step-Pause-Stop Buttons

## 7. SUGGESTED BOOKS

1. Digital Electronics principles, Devices and Applications by Anil K. Maini
2. Modern Digital Electronics by R.P. Jain
3. Digital Logic Circuits by P.S. Manoharan
4. Digital Electronics, An Introduction to Theory and Practice by William H. Gothmann
5. Digital Electronics by S. K. Mandal
6. Digital Electronics and Logic Design by Jayadeep Chakravorthy
7. Digital Design Basic Concepts and Principles by Mohammad A. Karim

## 8. USEFUL LINKS

- https://stupidsid.com/popular-books/digital-system-design-ic-applications-10562
- https://books.google.co.in/books?isbn=0750672692
- https://books.google.co.in/books?id=gMtrAAAAIAAJ
- https://books.google.co.in/books?isbn=047051051X
- https://books.google.co.in/books?id=ogo_AAAAIAAJ

## 9. EXPERTS' DETAILS

The expert details which have been mentioned below are only a few of the eminent on Known Internationally, Nationally and Locally.

### INTERNATIONAL

3. Prof M. Morries Mano- California State University , Los Angeles
4. Prof. Willium H Gothmann, Spoken Vallay,Washington D.C., USA

**NATIONAL**

1. Dr. Anil K. Maini Consultant - Defence Technologies, Ex-Director LASTEC & Outstanding Scientist (DRDO) New Delhi Area, India

2. S. K. Mandal, Associate Professor Department of Electrical Engineering, National Institute of Technical Teachers Training and Research Kolkata

**REGIONAL**

1. Dr. Asha Rani , Dept. of ECE, JNTUH, Hyderabad.

2. Kodali Ravi Kishore, Associate Professor – NIT , Warangal

**10. (A) LAB SCHEDULE:** The lab schedule should be planned once in a week. The week wise scheduled experiment should be completed.

**CYCLE 1**

| **Batches** | **week-1** | **week-2** | **week-3** | **week-4** | **week-5** | **week-6** | week-7 |
|---|---|---|---|---|---|---|---|
| B1 | Demo | Exp.1 | Exp.2 | Exp.3 | Exp.4& Exp.5 | Exp.6 & Exp.7 | TEST |
| B2 | Demo | Exp.1 | Exp.2 | Exp.3 | Exp.4& Exp.5 | Exp.6 & Exp.7 | TEST |

**CYCLE 2**

| **Batches** | **week-1** | **week-2** | **week-3** | **week-4** | **week-5** | **week-6** | week-7 |
|---|---|---|---|---|---|---|---|
| B1 | Exp.8 | Exp.9 | Exp.10 | Exp.11& Exp.12 | Exp.13& Exp.14 | Exp.15 | TEST |
| B2 | Exp.8 | Exp.9 | Exp.10 | Exp.11& Exp.12 | Exp.13& Exp.14 | Exp.15 | TEST |

**(B) VIVA SCHEDULE:** The viva schedule should be planned prior starting to the lab experiment.

**ROUND -** 1

| **Batches** | **week-1** | **week-2** | **week-3** | **week-4** | **week-5** |
|---|---|---|---|---|---|
| B1,B2,B3 | Viva | | | | |
| B1,B2,B3 | | viva | | | |
| B1,B2,B3 | | | viva | | |
| B1,B2,B3 | | | | viva | |

| | | | | | |
|---|---|---|---|---|---|
| B1,B2,B3 | | | | | viva |

**ROUND** - 2

| **Batches** | **week-1** | **week-2** | **week-3** | **week-4** | **week-5** |
|---|---|---|---|---|---|
| SG1 | Viva | | | | |
| SG2 | | viva | | | |
| SG3 | | | viva | | |
| SG4 | | | | viva | |
| SG5 | | | | | viva |

*SG: Selected Group with a maximum of 6 or 12 students

## (C) SCHEME OF EVALUATION

### INTERNAL LAB

| Day to Day Evaluation ------ 15 Marks | | | | | Internal Exam ---10 Marks | | |
|---|---|---|---|---|---|---|---|
| Uniform | Observation & Record | Performance of experiment | Result | Viva Voce | Aim, Apparatus, Program, Procedure | Execution and Result | Viva Voce |
| 3M | 3M | 3M | 3M | 3M | 4M | 2M | 4M |
| **Total Marks:15+10=25 Marks** | | | | | | | |

### EXTERNAL LAB

| **Aim, Apparatus, Program, Procedure** | **Execution** | **Result** | **Viva Voce** |
|---|---|---|---|
| 20M | 30M | 15M | 10M |
| **Total Marks:20+30+15+10=75 Marks** | | | |

# 11. PROJECT/PRODUCT/PAPER BASED LEARNING

## Clap On Clap off switch using 555 timer and IC 7474

Clap On Clap off switch works as an automated switch that makes devices On and Off by making merely a clap sound or other similar pitch sound. It is based on 555 timer IC and electric condenser Mic, which is working as a sound sensor. Condenser Mic basically converts sound energy into electrical energy, that in turns used to trigger 555 timer IC, through a Transistor. And triggering of 555 ic works as a Clock pulse for D-type flip-flop and would turn ON the LED, which will remain ON until the next clock pulse means until the next Clap/sound. So this is the Clap Switch which will turn ON with first Clap and turn OFF with the second Clap. If we remove the D-type Flip flop from the circuit, the LED will be turned OFF automatically after some time and this time will be 1.1xR1xC1 seconds,

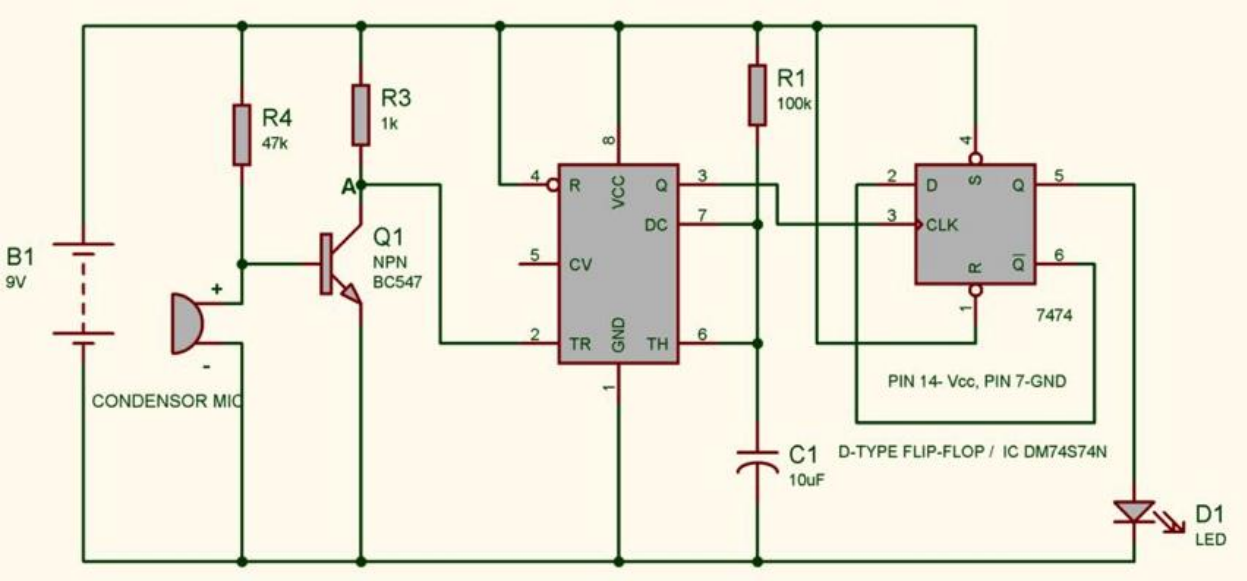
**Step 1: Required Components**

1. Condenser Mic
2. 555 Timer IC
3. Transistor BC547
4. Resistors (220, 1k, 10k, 100k ohm)
5. Capacitor (10uF)
6. IC7474 more precisely DM74S74N (D-type flip flop)
7. LED and Battery (5-9v)

You can see the circuits and connections. Initially the transistor is in OFF state because there is not enough (0.7v) base-emitter voltage to turn it ON. And the point A is at high potential, and point A is connected to Trigger pin 2 of 555 IC, as a result Trigger pin 2 is also at high potential. As we know that, to trigger the 555 IC through Trigger PIN 2, the voltage of the PIN 2 must be below

Vcc/3. So at this stage no output at OUT PIN 3, means no clock pulse for D-type Flip-flop (IC7474), means no response from D-type Flip-flop, and LED is OFF.

**Step 2: Circuit Diagram**

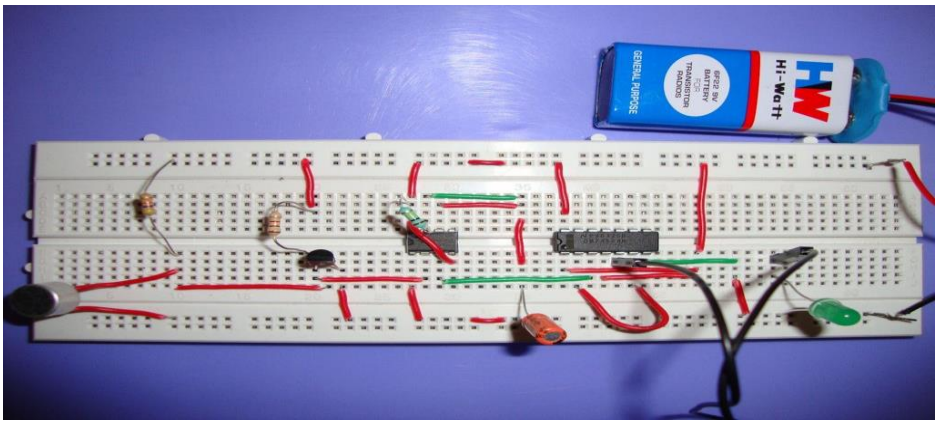



The complete circuit diagram of clap on clap of switch is shown in the above figure. In this circuit, Electric Condenser Mic is used for sensing the sound while transistor is used to trigger the 555 timer IC. The 555 timer IC further SET & RESET the D-type flip flop and D-type flip flop to remember the logic level (LED ON or OFF) until next Clap/sound. I have wrote a tutorial with the detailed version of the explanation of clap on clap off circuit. You can read it to understand the detailed working of flip flops in this circuit. As we are using the IC 555 in Monostable Mode, whose output has been used as a clock pulse for D-type Flip-flop IC. So the clock pulse will be HIGH for 1.1xR1xC1 seconds and then it would become LOW.

**Step 3: IC 7474**

After understanding the D-type Flip-flop and IC DM74S74N, we can easily understand the use of D-type Flip-flop in our circuit. When we first triggered the 555 IC by first Clap, the LED glows as we get Q=1 and Q'=0. And it will remain ON until the next trigger or next positive clock pulse (LOW to HIGH). We have connected Q' to to INPUT D, so when LED is glowing, Q'=0 is waiting for Second Clockpulse, so that it can be applied to the INPUT D and makes Q=0 and Q'=1, which in turns TURN OFF the LED. Now Q'=1 is waiting for next clockpulse to make the LED turn ON by applying Q'=1 to INPUT D, and so on this process will continue.

**Step 4: Working Explanation**




Now when we produce some sound near condenser MIC, this sound will be converted into electrical energy and it will raise the potential at the Base, which will turn the Transistor ON. As soon as the transistor becomes ON, the potential at Point A would become low and it will trigger the 555 IC because of the low voltage (below Vcc/3) at Trigger Pin 2. So the output PIN3 will be high and a positive clock pulse will be applied to D-type Flip-flop, which makes Flip-flop to respond and LED will turn ON. This SET state of flip flop will remain as it is until the next clock pulse (next Clap). Detailed working of D-type Flip-flop has been given below.

Here we are using 555 timer IC in Monostable Mode, whose output (PIN 3 of 555 IC) has been used as a clock pulse for D-type Flip-flop. So the clock pulse will be HIGH for 1.1*R1*C1 seconds and then it would become LOW.

We can modify this circuit using Relay to control the Electronic devices (120/220V AC). Control PIN 5 of 555 Timer IC should be connected to Ground through a 0.01uF capacitor. Also we should use a 220 ohm resistor to connect LED.

**12. MAPPING OF LAB WITH PROJECT/CONSULTANCY/R & D:**

The Basic simulation lab course should be designed in such a way that it should meet the requirements of research and development as well as consultancy projects. Also the Proposals of Project/R&D/Consultancy are as follows:

Proposal 1: R& D Level Project Design & Execution
Proposal 2: Project Design & Execution
Proposal 3: Consultancy Task / Project Design & Development

**PROPOSAL FOR R & D ACTIVITY:**

**1. An exact paper from a National/International journal in this entitled area/subject/area (IEEE Format)**

**An Implementation of a Biological Neural Model using Analog-Digital Integrated Circuits**

**Abstract:**
Given the trends in reconfigurable hardware systems inspired by biology, we present a hardware implementation of a closed-loop neural system. The hardware implementation focuses on modeling the behavior of two-cells, PD-LP system of a Pyloric Network from a lobster's stomach. This two-cell network emulates, in real-time, a digital representation of interacting neurons whose biological behavior is known. We evaluated the circuit design by varying the circuit values to determine the appropriateness and range of operation of the model. Future development of hardware models will be used to evaluate the feasibility of creating a platform of specialized circuits or an FPNA of biological neural characteristics.

**PROPOSAL FOR PROJECT ACTIVITY** :

**Real-Time Measurements of Cell Proliferation Using a Lab-on-CMOS Capacitance Sensor Array**

**Abstract**
We describe a capacitance sensor array that has been incorporated into a lab-on-CMOS system for applications in monitoring cell viability. This paper presents analytical models, calibration results, and measured experimental results of the biosensor. The sensor has been characterized and exhibits a sensitivity of 590 kHz/fF. We report results from benchtop tests and in vitro experiments demonstrating on-chip

tracking of cell adhesion as well as monitoring of cell viability. Human ovarian cancer cells were cultured on chip, and measured capacitance responses were validated by comparison with images from photomicrographs of the chip surface. Analysis was performed to quantify cell proliferation and adhesion, and responses to live cells were estimated to be 100 aF/cell.

**PROPOSAL FOR CONSULTANCY:**

A proposal has been made to implement the following project using Digital IC Applications for Wineyard Technologies Pvt. Ltd, Hyderabad.

## Building smart cities: Automatic gas cylinder booking over IoT

**ABSTRACT**

Liquified Petroleum gas (LPG) is the common one for all cooking applications. Most of us are prone to much difficulty when the gas cylinder gets emptied during the peak cooking hours. We present this project in order to create awareness about the decreasing weight due to consumption of the gas and to automatically update for gas booking office. Continuous measurement of the weight is being done. That is given here as load cell to measure the weight. Here we are using AT89S52 as our controller. A threshold value is set in the controller. Controller will keep on checking load cell. When that value is met then automatic booking can be done. The same is displayed on the LCD, which is connected to the output port of the controller. Automatic booking will be possible through the IoT module interfaced to the controller through which the data is available in the internet. This project uses regulated 5V, 500mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac out put of secondary of 230/12V step down transformer.

## 13. GUIDELINES FOR SHADOW ENGINEERING (VIP)

### INDUSTRIAL VISITS (IIP – INNOVATIVE INDUSTRIAL LEARNING PROGRAM):

**OBJECTIVES OF SHADOW ENGINEERING:**

1. The program which uplifts the knowledge of the students related to laboratories.
2. To improve the industry-college interactions.
3. To create industry like environment for all the students in order to make future Assignment.
4. This program leads to matrixing with the students.

**PROPOSALS (WEEK WISE INDUSTRIAL VISITS) (IN HOUSE OR OUTSIDE VISIT)/TRAINING PROGRAMMES:**

**TABLE 1: INDUSTRIAL VISITS**

| S.no | Type of industry | Nature of industry | Date of visit | No. of students participated | Year/branch | remarks |
|---|---|---|---|---|---|---|
| 1 | TV station | Broadcasting | | 60 | II/1V I SEM | |
| | | | | | | |

**14. CALIBRATION/INSTALLATION AND TESTING:**

**CALIBRATION:** Aim of this concept is to check,

iv. Whether all the equipment is functioning correctly as per the standards
v. To bring correctness in the errors of instrument or equipment
vi. To rectify the errors if any

**INSTALLATION:** Aim of this concept is to make and maintain installation procedure for a new equipment or already existing equipment.

**TESTING:** Aim of this concept is to test the equipment after installation whether it meets the existing standards.

**15. MAINTAINANCE AND TROUBLESHOOTING:**

**(A) TROUBLE SHOOTING SCHEDULES:**

A proposal is to be made from each lab branch wise. The proposal should carry following details related to specific equipment in lab.
The basic simulation lab consists of 30 systems all are working in good condition.

**16. ASSESSMENT AND ACCREDITATION PROCESDURE AS PER NABL**

Accreditation is the formal recognition, authorization and registration of a laboratory that has demonstrated its capability, competence and credibility to carry out the tasks. It provides the feedback to laboratories as to whether they are performing according to technical competence as per guidelines of NABL (National Accreditation Board for Testing and Calibration Laboratories)

The laboratory should carry out the following important tasks towards getting ready for accreditation from NABL.

1. Preparation of methodology in each experiment.

2. Preparation of Standard Operating procedure for each equipment
3. Preparation of Laboratory Manual as per the guidelines specified by Combined Lab Team(CLT) headed by Principal/HOD/Dean/ in charge
4. Ensure Effective environmental conditions (temperature, humidity, storage and placement) in the laboratories by implementing proper housekeeping and cleaning of the equipments from dust, dirt etc.
5. Ensure Calibration of instruments/equipment (Only NABL accredited authorized laboratories provide calibration.
6. All the details of Calibration should be included in the format specified exclusively for calibration procedure.
7. Ensure proper implementation of all the documents, formats to be included in the lab manual.
8. Impart training for all the technicians working in labs about the importance of documentation, log sheets, operating procedure of the lab.
9. Incorporate Internal Lab audits for effective functioning of the laboratories. Audits may be once in a month or 3 months or at the end of the semester. The audit schedule will be decided by the Chairman and Principal of the CLT team.
10. Auditors should submit the detailed report of each lab duly signed to the Principal.
11. Each lab should maintain all the bills/invoices of each instrument or equipment in a separate file.
12. All the stock registers either consumable or non consumable should be updated whenever any purchases of consumables or equipment takes place.
13. All the safety precautions are properly displayed in front of each lab.
14. All the Lead experiments should be maintained separately in a record /record in a separate folder.
15. Based on Pre Assessment report submitted by auditor, corrective actions should be carried out by each lab in charge and that must be forwarded to concerned HOD and Principal.

# SUBJECTWISE LAB PLANNER

## MICROWAVE AND DIGITAL COMMUNICATION LAB

**CONTENTS:**

## 1. OBJECTIVE *AND RELEVANCE*

The main objective of this lab is to gain the practical hands on experience by exposing the students to various microwave bench setups and microwave components. And also understanding of the concepts involved in microwave signal generation, transmission and reception in microwave communication.

## 2. SCOPE

Understanding of Microwave lab has the scope to make the learner comfortable to work in the communication area. This subject gives us an idea or overview to learn concepts of microwave engineering.

## 3. PREREQUISITES

Knowledge of microwave components propagation of wave concepts and the operation of CRO is required. This lab recommends complete practice of microwave components and devices.

## 4. SYLLABUS AS PER JNTUH

### Part A: MICROWAVE ENGINEERING LAB

1.Reflex Klystron Characteristics

2. Gunn Diode Characteristics

3. Directional Coupler Characteristics

4. VSWR Measurement

5. Measurement of Waveguide Parameters

6. Measurement of Impedance of given load

7. Measurement of Scattering Parameters of a Magic Tee

8. Measurement of Scattering Parameters of a Circulator

9. Attenuation Measurement

10. Microwave Frequency Measurement

### PART –B :DIGITAL COMMUNICATION LAB

1. PCM Generation and Detection.

2. Differential pulse code modulation

3.. Delta modulation

4. Time division multiplexing of 2 band limited signals.

5. Frequency shift keying: Generation and Detection.

6. Phase shift keying : Generation and Detection.

7. Amplitude shift keying : Generation and Detection

8. Study of the spectral characteristics of PAM,QAM.

9. DPSK :Generation and Detection

10. QPSK: Generation and Detection

**Equipment required for Laboratories:**

**Part A: Microwave Engineering Lab**

1. Microwave Bench set up with klystron Power supply.
2. Microwave Bench set up with Gunn Power supply.
3. Micro Ammeter
4. VSWR meter
5. Microwave Components

**Part –B :Digital Communication Lab**

1. RPS - 0 – 30 V
2. CRO - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz
4. RF Generators - 0 – 1000 M Hz./0 – 100 M Hz.
5. Multimeters
6. Lab Experimental kits for Digital Communication
7. Components
8. Radio Receiver/TV Receiver Demo kits or Trainees.

**MAIN LINKAGE OF MWE THEORY WITH LAB EXPERIMENTS MWE&DC**

**PART-I MWE LAB**

**EXPERIMENT NO 1**

Characteristics of the Reflex Klystron Tube.

**OBJECTIVE**

To study the characteristics of the Reflex Klystron Tube.

**PREREQUISITES**

Basic knowledge about Reflex Klystron Tube.

**DESCRIPTION**

a. Demonstration about experiment
b. Connecting microwave components which are required.
c. Observing the Frequency characteristics of Reflex Klystron Tube

**APPLICATIONS**

1. Satellite Communications
2. Radar Communications

**EXPERIMENT NO 2**

study V-I characteristics of Gunn Diode

**OBJECTIVE:**

To study V-I characteristics of Gunn Diode

**PREREQUISITES**

Basic knowledge about Gunn Diode

**DESCRIPTION**

a. Demonstration about experiment
b. Connecting microwave components which are required.
c. Observing the Characteristics of Gunn Diode.

**APPLICATIONS**

1. Satellite Communications
2. Radar Communications

**EXPERIMENT NO 3**

**OBJECTIVE**

Study the function of multi-hole directional coupler by measuring S parameters.

**PREREQUISITES**

Basic knowledge about multi-hole directional coupler

**DESCRIPTION**

a. Demonstration about experiment
b. Connecting microwave components which are required.
c. Observing the Characteristics multi-hole directional coupler.

**APPLICATIONS**

Couplers are commonly used for sampling a single direction of power which is flowing through a transmission line.

**EXPERIMENT NO 4:**

**OBJECTIVE:**

To Measure the VSWR (Voltage standing wave ratio).

**PREREQUISITES:**
Basic knowledge of electromagnetic wave theory.

**DESCRIPTION:**
a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of VSWR meter.
d. Mathematical calculations to find VSWR

**APPLICATIONS:**
1.Cellular communication
2.wifi communication

**EXPERIMENT NO 5 :**
Measurement of waveguide parameters
**OBJECTIVE:**
To measure the guided wavelength, phase velocity and group velocity of a waveguide.
**PREREQUISITES:**
Basic knowledge of electromagnetic wave theory.
**DESCRIPTION:**
a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Measurement of Waveguide Parameter.
d. Mathematical calculations to find phase velocity, group velocity and guide wavelength

**APPLICATIONS:**
1. Signal Phase velocity, group velocity , impedance can be measured.

**EXPERIMENT NO 6:**
Measurement of Impedance of given load.

**OBJECTIVE:**
To measure the unknown impedance at the input of the given component under test.
**PREREQUISITES:**
Basic knowledge of electromagnetic wave theory.
**DESCRIPTION:**
a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination
d. Mathematical calculations to find impedance
**APPLICATIONS:**
The unknown terminating impedance can be determined by measuring standing wave ratio & distance of a convenient maxima or minima from the load.

**EXPERIMENT NO 7**

**OBJECTIVE**

To Study the Scattering parameters of Magic Tee

**PREREQUISITES:**

Basic knowledge about Magic Tee

**DESCRIPTION**

1. Demonstration about experiment
2. Connecting microwave components which are required.
3. Observing the Characteristics Magic Tee.

**APLICATIONS**

1. Used As Duplexer
2. Used as Mixer

**EXPERIMENT NO 8:**

Measurement of Scattering Parameters of a Circulator

**OBJECTIVE:**

To measure the S parameters (magnitude) of the Circulator.

**PREREQUISITES**:

Basic knowledge of S-parameters and microwave bench setup.

**DESCRIPTION:**

a. Introduction to experiment
b. Connection of experiment and its verifications
c. Experimental determination
d. Mathematical calculations to find s parameters

**APPLICATIONS:**

1. Isolator
2. Duplexer
3. Reflection amplifier

**EXPERIMENT NO 9:**

**OBJECTIVE:**

To measure the attenuation introduced by the given wave guide.

**PREREQUISITES**

Basic knowledge of electromagnetic wave theory.

**DESCRIPTION:**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination
d. Mathematical calculations to find attenuation

**APPLICATIONS:**

1. Variable and fixed attenuation measurement of the signal.

**EXPERIMENT NO 10**

**OBJECTIVE:**

To measure the frequency of a microwave source

**PREREQUISITES:**

Basic knowledge of electromagnetic wave theory.

**DESCRIPTION:**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Measurement of microwave frequency.

**APPLICATIONS:**

1. Frequency measurement in communication.

**PART-2 DC LAB**

**EXPERIMENT NO 1:**

**UNIT-2:**

Pulse code modulation & demodulation

**OBJECTIVE:** To convert an analog signal into a pulse digital signal using PCM system and to convert the digital signal into analog signal using PCM demodulation system.

**PREREQUISITES:** Basic knowledge of modulation and demodulation techniques

**Description:**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Experimental determination of Pulse code modulation & demodulation.

d. Graphical determination of input and output waveforms of Pulse code modulation & demodulation

**APPLICATIONS:**

1. Used as A/D converter
2. Used as D/A converter

**EXPERIMENT NO 2**:

**UNIT-2:**

Differential Pulse code modulation

**OBJECTIVE:** To convert an analog signal into a pulse digital signal using DPCM system and to convert the digital signal into analog signal using PCM demodulation system.

**PREREQUISITES:** Basic knowledge of modulation and demodulation techniques

**Description:**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of Differential Pulse code modulation & demodulation.
d. Graphical determination of input and output waveforms of Differential Pulse code modulation & demodulation

**APPLICATIONS:**

1. Used as A/D converter and D/A converter

**EXPERIMENT NO 3**

**UNIT-2:**

Delta modulation and Demodulation

**OBJECTIVE:** To transmit an analog message signal in its digital form and again reconstruct back the original analog message signal at receiver by using Delta modulator.

**PREREQUISITES:** Basic knowledge of modulation and demodulation techniques

**Description:**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of Delta modulation and Demodulation.
d. Graphical determination of input and output waveforms of Delta modulation and Demodulation

**APPLICATIONS:**

1. Used as A/D converter

**EXPERIMENT NO 4:**

**UNIT-1:**

**EXPERIMENT NO 1: Time division multiplexing of 2 band limited signals**

**OBJECTIVE:** To transmit a multiplexed output of different frequency message signals through a single channel using TDM system and recover back the original message signals through a de-multiplexer at receiver end.

**PREREQUISITES:** Basic knowledge of multiplexing and demultiplexing techniques.

**Description:**

a. Introduction to experiment -30 min
b. Connection of experiment and its verifications
c. Experimental determination of time division multiplexing and demultiplexing.
d. Graphical determination of input and output waveforms of Time division multiplexing and demultiplexing

**APPLICATIONS:**

1. Used as Multiplexer
2. Used as Demultiplexer

**EXPERIMENT NO 5**

**UNIT-2:**

Frequency shift keying: Generation and Detection.

**OBJECTIVE:** To generate the frequency shift keying signal for a given binary data and also demodulate the original data input.

**PREREQUISITES:** Basic knowledge of shift keying techniques

**Description:**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Experimental determination of Frequency shift keying.

d. Graphical determination of input and output waveforms of Frequency shift keying.

**APPLICATIONS:**

1. Used in frequency division

**EXPERIMENT NO 6**

**UNIT-2:**

Phase shift keying : Generation and Detection

**OBJECTIVE:** To generate the phase shift keying signal for the given binary data & to demodulated to receive the transmitted binary data.

**PREREQUISITES:** Basic knowledge of shift keying techniques

**Description:**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Experimental determination of phase shift keying.

d. Graphical determination of input and output waveforms of phase shift keying .

**APPLICATIONS:**

1. Used as phase shifter

**EXPERIMENT NO 7**

**UNIT-2:**

Amplitude shift keying : Generation and Detection

**OBJECTIVE:** To generate the Amplitude shift keying signal for the given binary data & to demodulated to receive the transmitted binary data.

**PREREQUISITES:** Basic knowledge of shift keying techniques

**Description:**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Experimental determination of phase shift keying.

d. Graphical determination of input and output waveforms of Amplitude shift keying .

**APPLICATIONS:**

1. Optical fiber communication.

**EXPERIMENT NO 8**

Study of the spectral characteristics of PAM, QAM.

**OBJECTIVE:** To observe the spectral characteristics of PAM,QAM .

**PREREQUISITES:** Basic knowledge of spectrum analyser and PAM,QAM

**Description:**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Experimental determination of PAM, QAM.

d. Graphical determination of input and output waveforms..

**APPLICATIONS:**

1. Radio communications and data delivery applications

**EXPERIMENT NO 9**

**UNIT-2:**

Differential Phase shift keying : Generation and Detection

**OBJECTIVE:** To generate the Differential phase shift keying signal for the given binary data & to demodulated to receive the transmitted binary data.

**PREREQUISITES:** Basic knowledge of shift keying techniques

**Description:**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Experimental determination of Differential phase shift keying.

d. Graphical determination of input and output waveforms.

**APPLICATIONS:**

1.Radio communications and data delivery applications

**EXPERIMENT NO 10**

**UNIT-2:**

QPSK : Generation and Detection

**OBJECTIVE:** To generate the Quadrature phase shift keying signal for the given binary data & to demodulated to receive the transmitted binary data.

**PREREQUISITES:** Basic knowledge of shift keying techniques

**Description:**

a. Introduction to experiment -30 min

b. Connection of experiment and its verifications

c. Experimental determination of Quadrature phase shift keying.

d. Graphical determination of input and output waveforms.

**APPLICATIONS:**

1. Radio communications and data delivery applications

**5. LEAD EXPERIMENT**

**Aim**: To implement 8psk in the matlab

**Description:**

Eight Phase Shift Keying (**8PSK**) is a method to transmit digital information on a carrier by changing the phase of the carrier. In **8PSK** there are 8 different phase changes defined, each phase change represents the transmission of 3 bits.

**Matlab code :**

```
function epsk(g,f)
%For more information, visit: www.matpic.com
%Modulation  8PSK
%Example: g is a binay vector; f is the carrier frequency.
%epsk([1 0 1 1 1 0],2)
%Author: Diego Orlando Barragn Guerrero
%diegokillemall@yahoo.com
%Loja (ECUADOR)
%Long live Heavy-Metal
%See also:
%http://www.mathworks.com/matlabcentral/fileexchange/loadFile.do?objectId=14328&
objectType=FILE

if nargin > 2
    error('Too many input arguments');
elseif nargin==1
    f=1;
end

if f<1;
    error('Frequency must be bigger than 1');
```

```
end
%*-*-*-*-*-*
l=length(g);
r=l/3;
re=ceil(r);
val=re-r;

if val~=0;
    error('Please insert a vector divisible for 3');
end
%*-*-*-*-*-*


t=0:2*pi/149:2*pi;
cp=[];sp=[];
mod=[];mod1=[];bit=[];

for n=1:3:length(g);
    if g(n)==0 && g(n+1)==1 && g(n+2)==1
        die=cos(pi/8)*ones(1,150);
        die1=sin(pi/8)*ones(1,150);
        se=[zeros(1,50) ones(1,50) ones(1,50)];

    elseif g(n)==0 && g(n+1)==1 && g(n+2)==0
        die=cos(3*pi/8)*ones(1,150);
        die1=sin(3*pi/8)*ones(1,150);
        se=[zeros(1,50) ones(1,50) zeros(1,50)];

    elseif g(n)==0 && g(n+1)==0  && g(n+2)==0
        die=cos(5*pi/8)*ones(1,150);
        die1=sin(5*pi/8)*ones(1,150);
        se=[zeros(1,50) zeros(1,50) zeros(1,50)];

    elseif g(n)==0 && g(n+1)==0  && g(n+2)==1
        die=cos(7*pi/8)*ones(1,150);
        die1=sin(7*pi/8)*ones(1,150);
        se=[zeros(1,50) zeros(1,50) ones(1,50)];

    elseif g(n)==1 && g(n+1)==0  && g(n+2)==1
        die=cos(-7*pi/8)*ones(1,150);
        die1=sin(-7*pi/8)*ones(1,150);
        se=[ones(1,50) zeros(1,50) ones(1,50)];

    elseif g(n)==1 && g(n+1)==0  && g(n+2)==0
        die=cos(-5*pi/8)*ones(1,150);
        die1=sin(-5*pi/8)*ones(1,150);
        se=[ones(1,50) zeros(1,50) zeros(1,50)];

    elseif g(n)==1 && g(n+1)==1  && g(n+2)==0
        die=cos(-3*pi/8)*ones(1,150);
        die1=sin(-3*pi/8)*ones(1,150);
        se=[ones(1,50) ones(1,50) zeros(1,50)];

    elseif g(n)==1 && g(n+1)==1  && g(n+2)==1
        die=cos(-pi/8)*ones(1,150);
        die1=sin(-pi/8)*ones(1,150);
        se=[ones(1,50) ones(1,50) ones(1,50)];
```

```
    end
    c=cos(f*t);
    s=sin(f*t);
    cp=[cp die];    %Amplitude cosino
    sp=[sp -die1];  %Amplitude sino
    mod=[mod c];    %cosino carrier (Q)
    mod1=[mod1 s];  %sino carrier   (I)
    bit=[bit se];
end
opsk=cp.*mod+sp.*mod1;
subplot(2,1,1);plot(bit,'LineWidth',1.5);grid on;
title('Binary Signal')
axis([0 50*length(g) -1.5 1.5]);

subplot(2,1,2);plot(opsk,'LineWidth',1.5);grid on;
title('8PSK modulation')
axis([0 50*length(g) -1.5 1.5]);
```

## 6. VIRTUAL LAB EXPERIMENT

**Aim:**
Study of field pattern of various modes inside a rectangular waveguide cavity..

**Description:** A rectangular waveguide is a hollow metallic tube with a rectangular cross section. The conducting walls of the waveguide confine the electromagnetic fields and thereby guide the electromagnetic wave. The rectangular waveguide is basically characterized by its dimensions i.e., Length a and breadth b.

**Modes*:*** Electromagnetic waveguides are analyzed by solving Maxwell's equations, or their reduced form, the electromagnetic wave equation, with boundary conditions determined by the properties of the materials and their interfaces. These equations have multiple solutions, or modes, which are eigenfunctions of the equation system. Each mode is therefore characterized by an eigenvalue, which corresponds to a cutoff frequency below which the mode cannot exist in the guide.

Waveguide propagation modes depend on the operating wavelength and polarization and the shape and size of the guide. The modes of the waveguide are typically classified into following types:

- TE modes (Transverse Electric) have no electric field component in the direction of propagation.
- TM modes (Transverse Magnetic) have no magnetic field component in the direction of propagation.
- TEM modes (Transverse Electromagnetic) have neither electric nor magnetic field component in the direction of propagation.

## 7. SUGGESTED TEXT BOOKS

### TEXT BOOKS:

***Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition,1994.***

1. Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS
2. Publishers and Distributors, New Delhi, 2004.
3. Principles of communication systems-Herbert taub,Donald L skilling,Goutham Saha,3rd edition,McGraw-Hill,2008.
4. Digital communications-john G proakis,Masoud Salehi-5th edition, McGraw-Hill,2008.

### REFERENCES:

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Circuits and Passive Devices – M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd., New Age International Publishers Ltd., 1995.
3. Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI, 1999.
4. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th ed., 1955.
5. Elements of Microwave Engineering – R. Chatterjee, Affiliated East-West Press Pvt. Ltd., New Delhi, 1988.
6. Micro Wave and Radar Engineering – M. Kulkarni, Umesh Publications, 1998.
7. Digital communications-simon haykin john wiley,2005
8. Digital communications-theory, techniques and applications –R.N.Mutagi,2nd Edition 2013.

## 8. WEBSITES (USEFUL LINKS)

1. www.iitk.ac.in
2. www.iitd.ernet.in
3. https://www.youtube.com/watch?v=TsBTI3tO5-8
4. https://www.youtube.com/watch?v=tXfdv37gTU8
5. https://www.youtube.com/watch?v=WcJnxBsESlM
6. https://www.youtube.com/watch?v=qT6EmMkKevY
7. https://www.youtube.com/watch?v=kp33ZprO0Ck
8. https://www.youtube.com/watch?v=BLa9e2sz5L8
9. https://www.youtube.com/watch?v=g9EUU7dYrok
10. http://www2.electron.frba.utn.edu.ar/~jcecconi/Bibliografia/Ocultos/Libros/Microwave_Engineering_David_M_Pozar_ 4ed_Wiley_2012.pdf
11. http://www.microwave-eetimes.com/

## 9. EXPERT DETAILS

### INTERNATIONAL:

1. Samuel Y. Liao, professor of electrical Engineering, California University.
2. Philip F.Ordung, professor of electrical Engineering, Yale University.

**NATIONAL**

1. Manojith Mishra prof. & Head, Deptt. Of Tele communication Engg. B.E College Howrah
2. Prof. S. Bhaskaran - Head, Dept of Electronics, Velammal Engg College Chennai

**REGIONAL**

1. Prof. N.S. Murthy , Dept. of ECE, NIT, Warangal
2. Mr. T. Subba Rao ,HOD, Dept. of ECE, University college Engineering.

## 10(A).LAB SCHEDULE:

The lab schedule should be planned once in a week. The week wise scheduled experiment should be completed.

**CYCLE 1 (For 30 students per session and 3 students per batch)**

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 | week-8 |
|---|---|---|---|---|---|---|---|---|
| B1, B2 | Demo | Exp.1 | Exp.2 | Exp.10 | Exp.9 | Exp.7 | Exp.8 | Lead1 |
| B3, B4 | Demo | Exp.2 | Exp.10 | Exp.9 | Exp.8 | Exp.1 | Exp.3 | Lead1 |
| B5, B6 | Demo | Exp.10 | Exp.9 | Exp.8 | Exp.1 | Exp.2 | Exp.7 | Lead1 |
| B7, B8 | Demo | Exp.9 | Exp.8 | Exp.1 | Exp.3 | Exp.10 | Exp.2 | Lead1 |
| B9, B10 | Demo | Exp.8 | Exp.1 | Exp.2 | Exp.7 | Exp.3 | Exp.10 | Lead1 |

**CYCLE 2(For 30 students per session and 3 students per batch)**

| **Batches** | **week-1** | **week-2** | **week-3** | **week-4** | **week-5** | **week-6** | **week-7** | **week-8** |
|---|---|---|---|---|---|---|---|---|
| B1, B2 | Exp.3 | Exp.4 | Exp.6 | Exp.11 | Exp.12 | Exp.5 | Hobby/lead2 | Test |
| B3, B4 | Exp.7 | Exp.6 | Exp.11 | Exp.12 | Exp.5 | Exp.4 | Hobby/lead2 | Test |
| B5, B6 | Exp.3 | Exp.11 | Exp.12 | Exp.5 | Exp.4 | Exp.6 | Hobby/lead2 | Test |
| B7, B8 | Exp.7 | Exp.12 | Exp.5 | Exp.4 | Exp.6 | Exp.11 | Hobby/lead2 | test |
| B9, B10 | Exp.9 | Exp.5 | Exp.4 | Exp.6 | Exp.11 | Exp.12 | Hobby/lead2 | test |

**10(B).VIVA SCHEDULE**

**ROUND – 1 (For 30 students per session and 3 students per batch)**

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 |
|---|---|---|---|---|---|---|---|
| B1,B2,B3 | viva | | | | | | |
| B4,B5,B6 | | viva | | | | | |
| B7,B8,B9 | | | viva | | | | |
| B10,B11,B12 | | | | viva | | | |
| B13,B14,B15 | | | | | viva | | |
| B16.B17,B18 | | | | | | viva | |
| B19,B20 | | | | | | | Viva |

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 |
|---|---|---|---|---|---|---|---|
| SG1 | Viva | | | | | | |
| SG2 | | viva | | | | | |
| SG3 | | | viva | | | | |
| SG4 | | | | Viva | | | |
| SG5 | | | | | viva | | |
| SG6 | | | | | | viva | |
| SG7 | | | | | | | Viva |

**ROUND – 2**

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 |
|---|---|---|---|---|---|---|---|
| B1,B2,B3 | viva | | | | | | |
| B4,B5,B6 | | viva | | | | | |
| B7,B8,B9 | | | viva | | | | |
| B10,B11,B12 | | | | viva | | | |
| B13,B14,B15 | | | | | viva | | |
| B16.B17,B18 | | | | | | viva | |
| B19,B20 | | | | | | | Viva |

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 |
|---|---|---|---|---|---|---|---|
| SG1 | Viva | | | | | | |
| SG2 | | viva | | | | | |
| SG3 | | | viva | | | | |
| SG4 | | | | Viva | | | |
| SG5 | | | | | viva | | |
| SG6 | | | | | | viva | |
| SG7 | | | | | | | Viva |

**10 (C). SCHEME OF EVALUTION**

**LAB EXTERNAL**

| S no. | Write-up ( by Internal | Final evaluation (Internal Examiner) | Viva (External |
|---|---|---|---|
| 1 | Aim<br>Equipment needed<br>Circuit diagram<br>Procedure<br>Precautions<br>Tabular form<br>Expected graph | Based on observation, how the student is connecting the circuit, usage of equipment and typical readings<br>And based on correctness of the practical graph to the expected graph and results. | Based on understanding of Experiment and theoretical questions in the related subject. |
| | **Marks: 20** | **Marks: 20** | **Marks: 10** |
| **Total Marks:20+20+10=50 Marks** | | | |

**LAB INTERNAL**

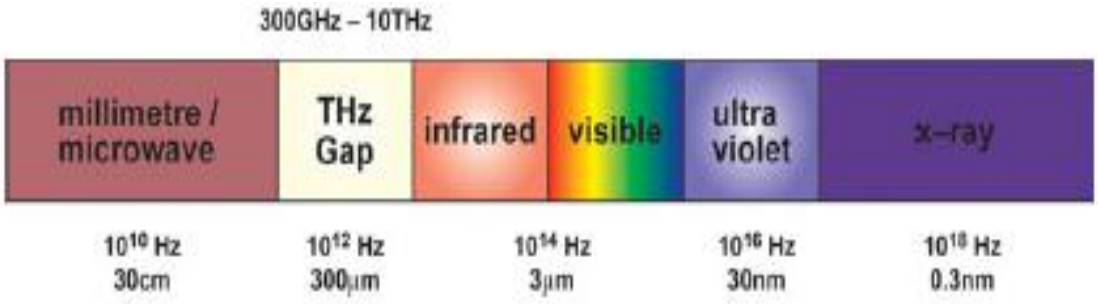
| **Day to Day Evaluation ------ 15 Marks** | | | | | **Internal Exam ---10M Marks** | | |
|---|---|---|---|---|---|---|---|
| Uniform | Observation & Record | Performance of experiment | Result | Viva Voce | Write-up | Connections & Result | Viva Voce |
| **Marks:3** | **Marks:3** | **Marks:3** | **Marks:3** | **Marks:3** | **Marks:4** | **Marks:3** | **Marks:3** |
| **Total Marks:15+10=25 Marks** | | | | | | | |

**11. PROJECT/PAPER/PRODUCT BASED LEARNING:**

**Potential applications for low-Tera-Hertz radar**

**ABSTRACT:**

The paper discusses the applications for which operation at terahertz frequencies can give significant advantages over operation at other wavebands. The review of potential applications must take account of the radar sensitivities which are practical at these wavelengths, including the atmospheric propagation characteristics. The most significant applications would appear to be more compact versions of some which applications for which millimetric radar has been looked at in recent years: automotive sensors, helicopter obstacle warning and missile fusing, although the different target and clutter characteristics at these frequencies are likely to lead to significant differences in the performance of the systems and to novel applications as the phenomenology becomes better characterized.




**Applications of tera hertz frequencies:**

- Imaging and Tomography
- Security screening
- Biomedical applications

## 12. MAPPING OF LAB WITH PROJECT/ CONSULTANCY/ R&D:

The lab course should be designed in such a way that it should meet the requirements of research and development as well as consultancy projects. Also the Proposals of Project/R&D/Consultancy are as follows:

Proposal 1: Project Design & Execution
Proposal 2: R& D Level Project Design & Execution
Proposal 3: Consultancy Task / Project Design & Development

PROPOSAL FOR R & D ACTIVITY:

1. An exact paper from a National/International journal in this entitled area/subject/area (IEEE Format) AND/OR
2. An article/white paper from a magazine /journal/weekly/any periodical in the entitled Subject AND/OR
3. An Advanced technology development/ proposal/article publication from any source of Information.

**Characterizing the S-Parameters of 75Ω Circuits using 50Ω Lab Equipment**

**Abstract**: RF engineers working with cable, terrestrial, or satellite TV applications are frequently required to make S-parameter measurements. Using a minimum loss pad to transform the conventional 50Ω test port impedance to the 75Ω device provides a cheap, easy way to get reasonable measurements. For most general lab applications below 1GHz, a PCB-mounted minimum loss pad built from 1% 0402 or similar resistors offers a quick and easy means to test a 75Ω circuit with 50Ω lab equipment. In most cases, the only correction factor required is the insertion loss of the MLP – 5.7dB plus any addition connectors. Difficult calculations or even Smith Chart work is often not required to make basic S Parameter measurements. RF engineers working with cable, terrestrial, or satellite TV applications are frequently required to make S-Parameter measurements on these circuits. The first time the uninitiated engineer uses a Vector

Network Analyzer to verify that a TV tuner input offers the return loss they expect, the problem becomes obvious: How do I measure [S]-parameters of my 75Ω DUT on a 50Ω VNA? If the situation warrants the cost, the answer is to buy lab equipment designed specifically for measuring 75Ω circuits (75Ω source and load impedance test ports). Otherwise, using a minimum loss pad to transform the conventional 50Ω test port impedance to the 75Ω DUT provides a cheap, easy way to get reasonable measurements. When an IC manufacturer specifies the input return loss (|S11|) of new cable TV LNA, the measurement is necessarily referred to 75Ω. That is to say, if |S11| = -30dB (reflected power is only one part in a thousand - essentially a perfect match), the idea is that when driven with a 75Ω source impedance, the device input will allow virtually all of the power to be transferred to the LNA. The same tuner input will NOT offer good return loss when driven from 50Ω source impedance. Directly connecting this perfectly-matched tuner input to a 50Ω VNA will yield a |S11| measurement something close to -14dB - with reflected power now one part in 25! So with this same 50Ω VNA, we can verify that the TV tuner input is as good.

.

PROPOSAL FOR PROJECT ACTIVITY:

1. A Proposal of a hobby/mini/proto/general/model/proto type project with extended abstract, Block Diagram/Circuit/Flow diagram and clear references may be presented and executed.

**Hobby Project**

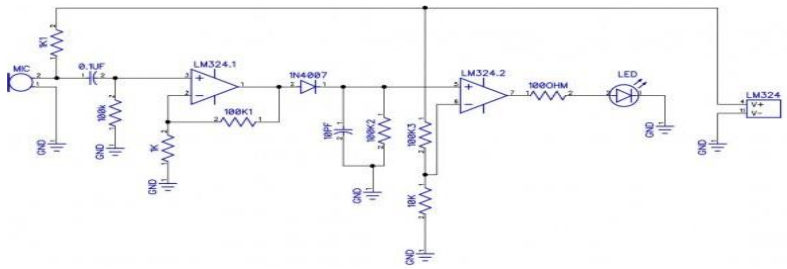
**Analysis of longitudinal slots in Rectangular waveguide using Finite Difference Method**

Recent advances in computer speed and storage have led to an increasing interest in developing new methodologies to satisfy a need for accurate and efficient numerical computation. The use of the Finite difference Method (FDM) for the numerical solution of electromagnetic scattering in unbounded regions requires proper absorbing boundary conditions (ABC) on the outer surface that truncates the infinite three-dimensional space. In this work we analyze a single radiating longitudinal slot in the broad wall of a rectangular waveguide using FDM which had been previously studied with the Method of Moments (MoM). It leads to a sparse matrix however its size becomes extremely large.

**PROPOSAL FOR CONSULTANCY:**

A program/machine/product of utility may be proposed to develop for in house usage/Industrial requirements may be useful for any outside agency that can be marketable in order to generate revenue through consultancy.

**Sound detector**




**FUNDED/UNFUNDED PROPOSALS (if any):**

The proposals for AICTE grants like (SDPs, RPS and MODROBES etc) UGC grants, DST PRI and other funding agencies by giving Title and abstract/objective OR Self Funded program proposals may be submitted for Management approvals.

## 13. GUIDELINES FOR SHADOW ENGINEERING (VIP) AND INDUSTRIAL VISITS (IIP – INNOVATIVE INDUSTRIAL LEARNING PROGRAM)

**INDUSTRIAL VISITS**

| S. No | Type of industry | Nature of industry | Date of visit | No. of students participated | Year/branch | Remarks |
|---|---|---|---|---|---|---|
| 1 | Medha Servo Drives | PCBs | | | IV/ECE | |
| 2 | Doordarshan kendra | Telecasting | | | IV/ECE | |

**TABLE 2: INDUSTRIAL TRAINING (SHADOW ENGINEERING)**

| S. No | Name of the Course | Nature of industry | Duration of Training | Authority | Date of Training/Certificate No. | remarks |
|---|---|---|---|---|---|---|
| 1 | OFC | Advanced Training Institute for Electronics and Process Instrumentation | 1 Week | GM | | |
| | | | | | | |

## 14. ACTIVITIES IN LIFT PROGRAM

**CALIBRATION**

| S.no | Type of equipment | Certificate issued by | Date of calibration | Date of calibration due | Remarks |
|---|---|---|---|---|---|
| 1 | Microwave bench | NVIS Technologies | | | |
| 2 | Microwave bench | NVIS Technologies | | | |

## 15. MAINTAINANCE AND TROUBLESHOOTING

**Maintenance Schedules**

| S. No. | Name of the Equipment | Date of Maintenance | Type of Activity | Remarks |
|---|---|---|---|---|
| 1 | MICROWAVE BENCH SETUP | | CHECKING WEATHER PROPERLY CONNECTED OR NOT | |

**Troubleshooting**

| S. No | Date of recording activity | Equipment Name | Type of Trouble | Remedial Activity | Remarks |
|---|---|---|---|---|---|
| 1 | | MICROWAVE BENCH SETUP | Distortion | PROPERLY CONNECTED BY TIGHTLY CONNECTING ALL COMPONENTS WITH THE HELP OF SCREWS | |

## 16. ASSESSMENT AND ACCREDITATION PROCESDURE AS PER NABL

Accreditation is the formal recognition, authorization and registration of a laboratory that has demonstrated its capability, competence and credibility to carry out the tasks. It provides the feedback to laboratories as to whether they are performing according to technical competence as per guidelines of NABL (National Accreditation Board for Testing and Calibration Laboratories)

The laboratory should carry out the following important tasks towards getting ready for accreditation from NABL.

1. Preparation of methodology in each experiment
2. Preparation of Standard Operating procedure for each equipment
3. Preparation of Laboratory Manual as per the guidelines specified by Combined Lab Team(CLT) headed by Principal/HOD/Dean/incharge
4. Ensure Effective environmental conditions(temperature, humidity,storage and placement) in the laboratories by implementing proper housekeeping and cleaning of the equipments from dust, dirt etc.
5. Ensure Calibration of instruments/equipment(Only NABL accredited authorized laboratories provide calibration.
6. All the details of Calibration should be included in the format specified exclusively for calibration procedure.
7. Ensure proper implementation of all the documents, formats to be included in the lab manual.
8. Impart training for all the technicians working in labs about the importance of documentation, log sheets, operating procedure of the lab.
9. Incorporate Internal Lab audits for effective functioning of the laboratories. Audits may be once in a month or 3 months or at the end of the semester. The audit schedule will be decided by the Chairman and Principal of the CLT team.
10. Auditors should submit the detailed report of each lab duly signed to the Principal.
11. Each lab should maintain all the bills/invoices of each instrument or equipment in a separate file.
12. All the stock registers either consumable or non consumable should be updated whenever any purchases of consumables or equipment takes place.
13. All the safety precautions are properly displayed in front of each lab.
14. All the Lead experiments should be maintained separately in a record /record in a separate folder.
15. Based on Pre Assessment report submitted by auditor, corrective actions should be carried out by each lab in charge and that must be forwarded to concerned HOD and Principal.

# SUBJECTWISE LAB PLANNER

## ADVANCED COMMUNICATION SKILLS LAB

**CONTENTS:**

## 1. OBJECTIVE AND RELEVANCE:

This Lab focuses on using computer-aided multimedia instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- Engage in debates.
- Participate in group discussions.
- Face interviews.
- Write project/research reports/technical reports.
- Make oral presentations.
- Write formal letters.
- Transfer information from non-verbal to verbal texts and vice versa.
- To take part in social and professional communication.

## 2. SCOPE:

The introduction of the English Language Lab is considered essential at 3rd year level. At this stage the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

## 3. PREREQUISITES:

- Basic knowledge of English grammar
- Use of Parts of speech, basic sentence pattern and tense forms
- Basic understanding of English vocabulary
- Ability to write simple and good English
- Have interest to learn the language

## 4. JNTUH SYLLABUS:

**LSRW Objectives**:

**Listening skills:**

**Objectives:**

To enable students to develop their listening skill so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation.

To equip students with necessary training in listening so that can comprehend the speech of people of different backgrounds and regions

**Speaking skills:**
**Objectives:**

To make students aware of the role of speaking in English and its contribution to their success.
To enable students to express themselves fluently and appropriately in social and professional contexts

**Reading skills:**
**Objectives:**
To develop an awareness in the students about the significance of silent reading and comprehension
To develop the ability of students to guess the meanings of words from context and grasp the overall message of the text, draw inferences etc

**Writing skills:**
**Objectives:**
To develop awareness in the students about writing as an exact and formal skill
To equip them with the components of different forms of writing, beginning with the lower order ones

**Exercise I**
Functional English - starting a conversation – responding appropriately and relevantly – using the right body language – role play in different situations.
**Exercise II**
Vocabulary building – synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, analogy, idioms and phrases.
**Exercise – III**
Group Discussion – dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and coherence.
**Exercise IV**
Interview Skills – concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele and video-conferencing.
**Exercise V**
Resume' writing – structure and presentation, planning, defining the career objective, projecting ones strengths and skill-sets, summary, formats and styles, letter-writing.
**Exercise VI**
Reading comprehension – reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, and critical reading.
**Exercise VII**
Technical Report writing – Types of formats and styles, subject matter – organization, clarity, coherence and style, planning, data-collection, tools, analysis.

## 5. LEAD EXPERIMENT:

**LEAD Experiment1:**

**Exercise VIII**

Exploring language through internet sources
www.readwritethink.org
My world of worlds: Building vocabulary lists
A biography study: Using role play to explore author?s lives
Analyzing famous speeches as arguments
And I quote: A punctuation proof reading mini lesson
A picture's worth thousand words: From image to detailed narrative

**LEAD Experiment2:**

**Exercise-IX** Seminar Presentations: under this exercise topics should be distributed to all students in advance. They should prepare a PPT presentation on given topic to present in the ELCS laboratory.

## 6. (A) LAB SCHEDULE:

The lab schedule is planned once in a week. The week wise scheduled experiment is as shown below.

**CYCLE 1 (For 60 students per session and 1 student per system)**

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 | week-8 |
|---|---|---|---|---|---|---|---|---|
| B1 | Demo | Exp.1 | Exp.2 | Exp.3 | Exp.4 | Exp.5 | Exp.6 | Lead1 |
| B2 | Demo | Exp.1 | Exp.2 | Exp.3 | Exp.4 | Exp.5 | Exp.6 | Lead1 |
| B3 | Demo | Exp.1 | Exp.2 | Exp.3 | Exp.4 | Exp.5 | Exp.6 | Lead1 |
| B4 | Demo | Exp.1 | Exp.2 | Exp.3 | Exp.4 | Exp.5 | Exp.6 | Lead1 |

**CYCLE 2(For 60 students per session and 1 student per system)**

| **Batches** | **week-** | **week-2** | **week-3** | **week-4** | **week-5** | **week-6** | week-7 | week-8 |
|---|---|---|---|---|---|---|---|---|
| B1 | Exp.7 | Exp.8 | Exp.9 | Exp.10 | Exp.11 | Exp.12 | Hobby/Lead2 | Internal Lab |
| B2 | Exp.7 | Exp.8 | Exp.9 | Exp.10 | Exp.11 | Exp.12 | Hobby/Lead2 | Internal Lab |
| B3 | Exp.7 | Exp.8 | Exp.9 | Exp.10 | Exp.11 | Exp.12 | Hobby/Lead2 | Internal Lab |
| B4 | Exp.7 | Exp.8 | Exp.9 | Exp.10 | Exp.11 | Exp.12 | Hobby/Lead2 | Internal Lab |

## (b) VIVA SCHEDULE:

The viva schedule is planned prior starting to the lab experiment as shown below.

**ROUND – 1**

| BATCH | WEEK 3 | WEEK 4 | WEEK 5 | WEEK 6 | WEEK 7 | WEEK 8 | WEEK 9 | WEEK11 | WEEK 12 |
|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| B1 | Viva | | | Viva | | | Viva | | |
| B2 | | Viva | | | Viva | | | Viva | |
| B3 | | | Viva | | | Viva | | | Viva |

| BATCH | WEEK 13 | WEEK 15 | WEEK 16 | WEEK 17 | WEEK 18 | WEEK 19 | WEEK 20 | WEEK 21 | WEEk 22 |
|---|---|---|---|---|---|---|---|---|---|
| B1 | Viva | | | Viva | | | Viva | | |
| B2 | | Viva | | | Viva | | | Viva | |
| B3 | | | Viva | | | Viva | | | Viva |

**ROUND - 2**

| BATCH | WEEK 23 | WEEK 24 | WEEK 26 | WEEK 27 | WEEK 28 | WEEK 29 |
|---|---|---|---|---|---|---|
| B1 | Viva | | | Viva | | |
| B2 | | Viva | | | Viva | |
| B3 | | | Viva | | | Viva |

**(C). SCHEME OF EVALUATION:**

**INTERNAL LAB**

| **Internal Lab Marks: 25** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Day to Day Evaluation 15 Marks** | | | | | **Internal Exam 10 Marks** | | |
| Observation | Record | Performance of experiment | Graphs & Result | Viva Voce | Aim, Apparatus, Program, Procedure | Execution & Result | Viva Voce |
| 3M | 3M | 3M | 3M | 3M | 4M | 3M | 3M |

**EXTERNL LAB**

| **External Lab Marks: 50** | | | |
|---|---|---|---|
| Aim, Apparatus, Program, Procedure | Execution | Calculations & Result | Viva Voce |
| 20M | 15M | 5M | 10M |

## 7. SUGGESTED BOOKS:

1. CMOS Logic Circuit Design - John P. Uyemura, Springer, 2007.
2. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
3. VLSI Design – A, Albert Raj, Latha, PHI, 2008.
4. Introduction to VLSI – Mead & Convey, BS Publictions, 2010.

5. VLSI Design – M. Micheal Vai, CRC Press, 2009.
6. Principles of CMOS VLSI Design - Weste and Eshraghian, Pearson Education, 1999.
7. Chip Design for Submicron VLSI: CMOS Layout & Simulation, - John P. Uyemura, Thomson Learning.
8. Introduction to VLSI Circuits and Systems - John .P. Uyemura, JohnWiley, 2003.
9. Digital Integrated Circuits - John M. Rabaey, PHI, EEE, 1997.
10. VLSI Technology – S.M. SZE, 2nd Edition, TMH, 2003.

## 8. WEB SITES (USEFUL LINKS):

**Listening**

1. Randall's ESL Cyber Listening Lab (http://www.esl-lab.com)
2. The English Listening Lounge (http://www.englishlistening.com)
3. The Academy of American Poets Listening Booth (http://www.poets.org/booth/booth.cfm/)
4. Speech Accent Archive: American accents *(Listen to regional differences in American English. )*
    a. (http://accent.gmu.edu/browse_maps/namerica.php)
5. English Listening Lab Online (http://www.elllo.org/)
6. The Bob and Rob Show*(podcast discussion and variety show on culture, language, vocabulary)*
    a. (http://www.thebobandrobshow.com/website/index.php)
    b. Speaking
7. ELEaston Pronunciation (http://evaeaston.com/)
8. 10 Tips for Successful Public Speaking from Toastmasters (http://www.toastmasters.org/MainMenuCategories/FreeResources/NeedHelpGivingaSpeech/TipsTechniques/10TipsforPublicSpeaking.aspx)
9. Allyn&Bacon Public Speaking Website (http://wps.ablongman.com/ab_public_speaking_2/)
10. McGraw-Hill Public Speaking Website (http://www.mhhe.com/socscience/comm/pubspeak_cmk_071307/)
11. McGraw-Hill Public Speaking Tutorial (http://www.mhhe.com/socscience/comm/new-home/tutorial/tutorial.htm)
12. Presentations and Public Speaking in English (http://www.englishclub.com/speaking/presentations.htm)
    a. Reading
13. Bartleby.com (http://www.bartleby.com/)
14. The Magazine Rack (http://www.magatopia.com/
15. Reader's Digest Magazine Articles (http://www.rd.com/
16. Reading Skills*(Using a Dictionary, Finding Main Ideas, Drawing Inferences, more from the AmLa Department of Mt. San Antonio College)*
    (http://vclass.mtsac.edu/amla-51/Skills%20Exercises/homework.htm)

17. Tips on Reading a Newspaper*(from the Bangkok Post)*
    (http://www.bangkokpost.com/education/rdtips.htmL)
18. ELC Study Zone *(http://web2.uvcs.uvic.ca/elc/studyzone/index.htm)*

**Writing**

1. Writing Tips: Sentence Builder (http://www2.actden.com/writ_den/tips/sentence/index.htm)
2. Writing Tips: Paragraphs (http://www2.actden.com/writ_den/tips/paragrap/index.htm)
3. Writing Tips: Essays (http://www2.actden.com/writ_den/tips/essay/index.htm)
4. Letter Writing Desk *(examples, samples, tips, formats)*
5. *(http://jobsearchtech.about.com/library/bl-business-letters.htm)*
6. Advanced Composition for Non-Native Speakers of English (http://www.eslbee.com/

## 9. EXPERT DETAILS

### INTERNATIONAL

1. Kummaravadivelu
   Professor in Applied Linguistics
   San Jose State University
   U.S.A
2. Penny Ur
   Professor in english Language Education
   Oranim Academic college of education
   Israel

### NATIONAL

1. Prof. Paul Gunashekar
   Dean School of English Language Education
   EFL-University-Hyderabad.

### REGIONAL

1. A. Rama Krishna Rao
   Professor in english
   JNTUH