**Round 0**

**VLAB proposal**

1 Introduction

* 1. Name of the Virtual Laboratory:

**AM Modulation and Demodulation**

* 1. Name of the Faculty Member:

**Ms.B.Thyla, Mr Sadasivam S and Ms.Aida Jones**

* 1. Department: **Electronics and Communication Engineering**
  2. Institute: **KCG College of Technology**
  3. Email ID: **thyla@kcgcollege.com**
  4. Objectives and Purpose of the Virtual Lab:

Objective:

**To Simulate virtually and Interpret Amplitude Modulation and De modulation waveforms**

**To Demonstrate Critical, Under and Over modulated AM waveforms**

Purpose:

**The basic knowledge of communication engineering starts with Amplitude Modulation. Interpreting AM and its waveform will simplify the understanding of other analog and digital modulation techniques.**

* 1. Discipline to which the lab belongs: **Electronics and Communication Engineering**
  2. Syllabi of Lab at various universities:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S.NO** | **ANNA UNIVERSITY** | **VISVESVARAYA TECHNICAL UNIVERSITY** | **INDIAN INSTITUTE OF TECHNOLOGY,**  **ROORKEY** | **JAWAHARLAL NEHRU TECHNICAL UNIVERSITY,HYDERABAD** | **NATIONAL INSTITUTE OF TECHNOLOGY –WARANGAL** |
|  | Signal Sampling and reconstruction | 10ECL58 - ANALOG COMMUNICATIONLAB + LIC LAB | ECN-352-Communication Systems Lab | **-** | EC357-Communication systems Lab |
|  | Time Division Multiplexing | 10ECL67-ADVANCED COMMUNICATION LAB | **-** | **-** | **-** |
|  | **AM Modulator and Demodulator** | **10ECL58 - ANALOG COMMUNICATIONLAB + LIC LAB** | **ECN-352-Communication Systems Lab** | **EC406PC: Analog and Digital communications lab** | **EC357-Communication systems Lab** |
|  | FM Modulator and Demodulator | 10ECL58 - ANALOG COMMUNICATIONLAB + LIC LAB | ECN-352-Communication Systems Lab | EC406PC: Analog and Digital communications lab | EC357-Communication systems Lab |
|  | Pulse Code Modulation and Demodulation | 10ECL67-ADVANCED COMMUNICATION LAB | ECN-352-Communication Systems Lab | EC406PC: Analog and Digital communications lab | EC357-Communication systems Lab |
|  | Delta Modulation and Demodulation | **-** | ECN-352-Communication Systems Lab | EC406PC: Analog and Digital communications lab | EC357-Communication systems Lab |
|  | Line coding schemes | **-** | **-** | **-** | EC357-Communication systems Lab |
|  | Simulation of ASK, FSK, and BPSK generation schemes | 10ECL67-ADVANCED COMMUNICATION LAB | ECN-352-Communication Systems Lab | EC406PC: Analog and Digital communications lab | EC357-Communication systems Lab |
|  | Simulation of DPSK, QPSK and QAM generation schemes | 10ECL67-ADVANCED COMMUNICATION LAB | **-** | EC406PC: Analog and Digital communications lab | EC357-Communication systems Lab |
|  | Simulation of signal constellations of BPSK, QPSK and QAM | 10ECL67-ADVANCED COMMUNICATION LAB | **-** | EC406PC: Analog and Digital communications lab | EC357-Communication systems Lab |
|  | Simulation of ASK, FSK and BPSK detection schemes | 10ECL67-ADVANCED COMMUNICATION LAB | **-** | EC406PC: Analog and Digital communications lab | EC357-Communication systems Lab |
|  | Simulation of Linear Block and Cyclic error control coding schemes | **-** | **-** | **-** | **-** |
|  | Simulation of Convolution coding scheme | **-** | **-** | **-** | **-** |
|  | Communication link simulation | **-** | **-** | **-** | **-** |

* 1. **List of experiments:**

Signal Sampling and reconstruction

Time Division Multiplexing

**AM Modulator and Demodulator**

FM Modulator and Demodulator

Pulse Code Modulation and Demodulation

Delta Modulation and Demodulation

Line coding schemes

Simulation of ASK, FSK, and BPSK generation schemes

Simulation of DPSK, QPSK and QAM generation schemes

Simulation of signal constellations of BPSK, QPSK and QAM

Simulation of ASK, FSK and BPSK detection schemes

Simulation of Linear Block and Cyclic error control coding schemes

Simulation of Convolution coding scheme

Communication link simulation

* 1. Target Group:

**Pre final year Students of Communication Engineering and faculty teaching engineering**

1. Virtualization
   1. How do you intend to virtualize the experiments?

* **AM modulation and De-Modulation is the basic communication Experiment.**
* **The understanding of the experiment lies in the interpretation of the waveforms generated.**
* **So the importance is given for generating the AM waveforms which includes the message signal, carrier signal and modulated waveform.**
* **The user has to input the values of message signal and carrier signal frequency in Hz and amplitude in volts which in turn produce related waveforms.**
* **Three degrees of modulation (Critical, Over and Under) can also be visualized through the experiment.**
* **The modulated signal is fed to the demodulator circuit and output demodulated signal which is equivalent to the input signal is observed.**
  1. How will the student get a feel for a real lab?
* **Students will have the access of lab equipments virtually and can interpret and practice, become familiar and confident with the equipments before doing the real labs.**
* **Students can set the various values and infer the changes in the waveform which will further give them a feel for a real lab.**
  1. Will you be using animations?
* **Yes we will be using animations while visualizing the different waveforms.**

1. Technologies Used
   1. Software to be used for Web interface:

**Hyper Text Mark up Language (HTML), Cascading Style Sheets (CSS) and Java Script**

* 1. Software to be used for back-end

**Hyper Text Mark up Language (HTML), Cascading Style Sheets (CSS) and Java Script**

* 1. Any other: **NA**

1. Documentation

# Online manual:

**Theory and Manual of the experiment will be provided in separate tab of the experiments before Simulation tab so that it improves the interpreting of the experiment of the students.**

**Theory of Amplitude Modulation:**

Modulation is defined as the process by which some characteristics of a carrier signal is varied in accordance with a modulating signal. The base band signal is referred to as the modulating signal and the output of the modulation process is called as the modulation signal. Amplitude modulation is defined as the process in which is the amplitude of the carrier wave is varied about a means values linearly with the base band signal. The envelope of the modulating wave has the same shape as the base band signal provided the following two requirements are satisfied

# Step by step procedure:

**The Step by step procedure will added after the theory tab and before the simulation tab of the experiment. The sample procedure is given below:**

* The carrier signal frequency and amplitude to be set
* The modulating signal frequency and amplitude to be set
* The amplitude of the modulated waveform should be noted.
* By varying the amplitude of modulating signal corresponding maximum (Vmax) and minimum (Vmin) amplitude of the modulated signal is noted
* The practical modulation index is calculated using the following formula.

m a = (Vmax - Vmin ) / (Vmax + Vmin )

* Based on the modulation Index degrees of modulation can be interpreted.

# Quiz for self-evaluation:

Pre test and Post test based on multiple choice questions will be given to evaluate the understanding of the students.

Some of the sample questions are given below:

* What is Modulation?
* What is Need for Modulation?
* What is Amplitude Modulation?
* Define Modulation Index
* What are degrees of Amplitude Modulation?
* How to calculate the modulation Index practically?
* What should be varied in order to check the degrees of AM?
* Which has higher frequency carrier or modulating signal? Justify the answer

# Related resources:

1. Student Feedback and Learning
   1. How will you collect feedback and use them?

The experiment will be shared among variety of students and their experience and feedback will be collected using google forms before the final version. The experiment will be changed based on the feedback received.

* 1. What is the actual learning component?

The actual learning component:

Interpretation of AM waveforms based on the values of carrier signal and modulating signal which will demonstrate the students the basics and need for modulation

* 1. After the Virtual Lab experience, can the student perform the experiment in the real lab?

Students will have the access of lab equipments virtually and can interpret and practice, become familiar and confident with the equipments before doing the real labs.