# EEE282 Electronic Circuits and Simulation Lab
# Mini Project Description and Guidelines

**Due Date: 16th November 2016**

## Objective

The objective of mini project in the course EEE282 Electronic Circuits and simulation Lab is to help students in understanding and solving real world problems in the field of analog electronics thereby developing practical ability and knowledge about tools / techniques involved in solving problems. Students will select projects in teams and each student will have to prepare proper documentation consisting of problem statements, specification, design aspects, modeling techniques, analysis, Implementation and Testing strategies.

## Problem Statements

### Category A

1. A nationalized bank requires a burglar siren/alarm to be installed in their main entrance for security purpose. Design a suitable circuit.
2. An Industry requires a power supply for testing its products. The testing method involves applying various voltages to the Unit Under Test (UUT). Design a power supply with following specifications:
    - $\pm$5V at 1A
    - Variable power supply (0 – 15)V at 1A
3. Design a motor control unit to control the speed of a dc motor rated at 1HP.
4. An industry requires a battery voltage tester for indicating the voltage level. Design a suitable circuit to indicate each incremental voltage threshold. Consider at least 5 thresholds and battery voltage of 24V.
5. Design a motor control unit to control a stepper motor.

### Category B

1. An Industry requires a power supply for testing its products. The testing method involves applying various voltages to the Unit Under Test (UUT). Design a power supply with following specifications:
    - $\pm$15V at 1A
    - Variable power supply (0 – 30)V at 2A

    The power supply will be handled by amateur persons, so the industry needs overcurrent indication and high current protection.
2. A three star hotel in the city needs to be automated with features like automatic/remote lighting control, security system with alarm, activation of power circuit with room key and exterior light for roof garden restaurant. Design a suitable circuit to incorporate these features.
3. Varun faces severe voltage fluctuation in his home. He wants to protect the electrical appliances using an electronic circuit during voltage fluctuations. Design a suitable circuit to indicate voltage fluctuations and thereby to trip the circuit when fluctuations occur. The circuit should have auto reclose facility.
4. Ram uses a 12V, 180Ah battery charged from grid to back up his study room loads. He wants a circuit to automatically charge the battery when it reaches below a certain level. Design a suitable circuit. The circuit should have a voltage level indicator.
5. Design a LED reading lamp for your study room. Lamp specifications: 10W. Use 10 numbers of 1W LED.

### Category C

1. A chocolate manufacturing unit requires an optical based wrapper detection mechanism to detect the wrapped chocolate bars. Design a suitable wrapper detection mechanism for a conveyor belt to detect wrapped chocolates.
2. Design an automatic lock system for your four wheeler which includes window sliding system and automatic remote locking with alarm.
3. Design a music system for your home. A stereo system should have a stereo output speaker with woofer and tweeter.
4. In a chemical industry, It is required to control the temperature of a furnace automatically. If the furnace temperature goes beyond the Preset temperature then heater will get turned off and if temperature goes below the set value then heater gets turned on. Design a suitable temperature control unit.
5. A Manufacturing Industry has different rotating machineries to cater for its loads. As a step towards automation it needs a protection unit for early identification of machine failures. Design a suitable circuit for the industry requirement.

## Constraints

- Student may use any simulation tool such as MultiSim, OrCAD, TINAPro, LTSPICE, HSPICE, Proteus, Micro-cap etc., for design analysis.
- Circuits should be designed using electronic devices (Diodes, Transistors), basic components (resistors, capacitors and inductors) and digital gates only.
- ICs like 723, 317, 555, ADC, DAC should not be used. Dedicated ICs also should not be used.
- Bridge rectifier modules, 78xx and 79xx ICs, relays, buzzers can be used
- Use of basic sensors like LDR, thermistor, IR sensors etc., are allowed.
- For any clarification please consult the faculty.

## Guidelines

- A team size of **maximum three** is allowed.
- Problem statement is classified into **three categories**. The categories are formed **based on the complexity** involved in the problem statement.

  Category A - easy to solve
  Category B - medium complexity
  Category C - high level of complexity
- Each team is **free** to select any one project from all three categories.

## Guidelines for Project Report Preparation

- A detailed project report typed either in word or in LaTek of **no more than 8 pages** should be submitted on or before **16th November 2016.**
- Report should include the **problem statement, detailed specification, design aspects, simulation, implementation circuit and results/analysis**.
- The Project Report should contain the following headings:
  - Title of the Project
  - Introduction and Objectives of the Project
  - Problem definition, Requirement Specifications (Detailed Functional Requirements and Technical Specifications), analysis, design aspects, implementation circuit and simulation.
  - References in IEEE Format.
- Phase-I report (Max. 2 pages) consisting of **problem statement, detailed specification, circuit design should be submitted on or before 26th October 2016**.

## Evaluation

- Mini-Project is evaluated for maximum 30 marks.
- **Evaluation weightage is different** for each category. This is done to encourage students to solve high level complexity problems.

  Category A - Max 70%
  Category B - Max 85%
  Category C - Max 100%
- The components of examination includes:

  i) Problem formulation, Originality and detailed specification (10%)
  ii) Design approach, Simulation and Analysis (30%)
  iii) Hardware implementation (30%)
  iv) Participation in project work and Accomplishments (10%)
  v) Viva voce (20%)
- Design and Analysis must be your own work (or the joint work of your group). **Plagiarism** of any source, including another student's work, is not acceptable. Such reports will result in a **grade point of zero**.
- Failure to turn in a completed report on the due date will result in reduction of 25% of final grade points.

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