15EEE287 Electronic Circuits and Simulation – II Lab
Mini Project Description and Guidelines

Due Date: 2nd May 2017

Objective

The objective of mini project in the course 15EE287 Electronic Circuits & simulation –II 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:
   - ±15V at 2A
   - ±5V at 1A
   - Variable power supply (0 – 30)V at 2A
3. Design a high precision digital voltmeter that can measure and display dc voltage up to 30.00 V with a resolution of 10mV. Also address loading effects and over-voltage protection/detection.
4. Wind energy lab requires a battery voltage tester for indicating the voltage level. Design a suitable circuit to indicate each incremental voltage threshold. Consider atleast 4 thresholds and battery voltage of 24V.

Category B

1. Design a function generator capable of generating square, triangle, and sine waves. The frequency and amplitude of these waves should be controlled through potentiometers. There should be a switch to select between the signals.
2. Design an analog computer which can perform the following functions:
   i) Solve linear differential equations
   ii) Amplitude and time scaling
3. Design a motor control unit to control the speed of a dc motor.
4. 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.

Category C

1. A singer wants to practice singing with music. Design a vocal eliminator circuit which eliminates vocal tracks and delivers fine music alone.
2. Ashwin wants to install a high power stereo system in his room. Design a stereo system with two tweeters and two woofers to fit at the corners of his room.
3. Design biopotential amplifier specifically for ECG signals. You get to choose all specifications, but make sure that the signals are amplified without loss of any fidelity. Ensure that the amplifier provide amplification selective to the ECG signal, reject superimposed noise and interference signals, and guarantee protection from damages through voltage and current surges for both patient and electronic equipment. Also address the power-line interference problem.
4. Design a motor control unit to control the position of a servomotor.

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Constraints

- Student may use any simulation tool such as MATLAB, MultiSim, OrCAD, TINAPro, LTSPICE, HSPICE, Proteus, Micro-cap etc., for design analysis.
- Circuits should be designed using op-amps, electronic devices and basic components only.
- ICs like 380, 348, 723, 317, 555, ADC, DAC, 7474, 7447 can be used.
- For any clarification please feel free to consult me.

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 of **no more than 10 pages** should be submitted on or before **6th May 2017.**
- Report must be typed or very legibly handwritten, and must be proofread.
- 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 (if any).
  - Bibliography

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: (check the evaluation rubric)

  i) Originality
  ii) Design approach and Analysis
  iii) Participation in project work and Accomplishments
  iv) Viva voce
- 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.

Project Reviews

13th – 15th March 2017	Review 1 (Title, introduction, objectives)	5 marks
3rd – 5th April 2017	Review 2 (Circuit Design & simulation)	10 marks
2nd – 4th May 2017	Review 3 (Implementation & Results)	15 marks