SFSU – SCHOOL OF ENGINEERING AND COMPUTER SCIENCE

ENG 301 LABORATORY MANUAL

This Manual, downloadable from

http://online.sfsu.edu/~sfranco/CoursesAndLabs/Labs/301Labs.html

contains the pdf handouts for all lab experiments covered in Engr 301 – *Electronics Lab*.

Engr 301 extends the laboratory practices introduced in Engr 206 to a far more advanced level, focusing on the electronic devices covered in Engr 353 – *Electronics*. For best results, students are encouraged to take Engr 301 concurrently with Engr 353, or *after*, if prevented by scheduling conflicts. Engr 301 also prepares students for senior-level courses Engr 445, 453, and 455, to which it is a required prerequisite.

Following is a list of the various lab experiments, lasting an average of 2-1/2 weeks each:

1. **Time and Frequency Responses of Series *RLC* Circuits**
2. **Operational Amplifier Characteristics**
3. **Diode Characteristics and Applications**
4. **BJT Characteristics and Applications**
5. **MOSFET Characteristics and Applications**
6. **Logic Circuit Characteristics and Simple Logic Gates**

There is also an **Appendix**, giving tips on proto-board circuit construction, and a folder with the files associated with each of the **PSpice Examples** presented in the Manual – files that students can download to duplicate the examples on their own, if they wish to do so.

Lab #1 uses series *RLC* circuits to review and verify experimentally important systems-theory concepts that will prove useful in Engr 353 as well as a variety of other upper-division courses and labs.

Labs #2, **3**, **4**, and **5** investigate the basic ingredients of microelectronics: The **integrated-circuit operational amplifier**, the ***pn* diode**, the **bipolar junction transistor**, and the **MOS transistor**.

Lab #6 is designed especially for Computer Engineering students who may never take electronics labs again, and thus need a basic exposure to the electrical characteristics of basic digital circuits.

Each lab experiment is preceded by a detailed and self-contained review of the **theoretical background**. The experiment then proceeds with the **characterization** of the device under scrutiny as well as the investigation of some significant **applications**. The study of applications starts with **theoretical prediction** of circuit behavior using the results of the characterization, followed by **experimental verification**, followed by **computer simulation**, and it concludes with a comparison of the three approaches, with a justification of any discrepancies.

The above approach – characterization, prediction, experimentation, and computer simulation – is designed to prepare students for current industrial practice. A strong laboratory background constitutes an important asset for any student who envisions post-graduation work as a *test engineer*, a *product engineer*, an *applications engineer*, or a *design engineer*.

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