1. Course number and name
   ENGR 301: Electrical Measurement

2. Credits and contact hours
   1 credit hours

3. Instructor's or course coordinator's name
   Instructor: Ian Santos
   Course coordinator: Hao Jiang, Associate Prof. in EE

4. Text book, title, author, and year
   Franco, Sergio, and Klingenberg, Larry J. Lab Manual for ENGR 301

5. Specific course information
   a. brief description of the content of the course (catalog description)
      Measurement techniques, device characterization, experimental verification, and PSpice simulation. 2nd-order transient and frequency responses. Characterization of diodes, BJT's and FET's. Diode circuits, transistor amplifiers, simple logic gates.
   b. prerequisites or co-requisites
      ENGR 353 (Electronics) (can be taken concurrently)
   c. indicate whether a required, elective, or selected elective course in the program
      Required for Electrical Engineering and Computer Engineering

6. Specific goals for the course
   a. Specific outcomes of instruction, ex. The student will be able to explain the significance of current research about a particular topic.
      - To measure the characteristics of common electronic devices such as diodes, BJT's, FET's, and to compare with theoretical prediction.
      - To observe experimentally the behavior of the aforementioned devices in a variety of common applications, such as rectification, regulation, amplification, and digital logic, and to compare with theoretical prediction.
      - To simulate the aforementioned circuits via PSpice, and to compare with experimental observations.
      - To plot, analyze, and interpret data, and to prepare technical reports of appropriate quality.
   b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
• Students will demonstrate an ability to characterize junction diodes.
• Students will demonstrate an ability to characterize bipolar transistors.
• Students will demonstrate an ability to characterize field-effect transistors.
• Students will be able to verify experimentally popular diode applications such as rectification and regulation, and compare with theoretical prediction.
• Students will be able to verify experimentally popular BJT applications such as amplification and digital logic, and compare with theoretical predictions.
• Students will be able to verify experimentally popular FET applications such as amplification and digital logic, and compare with theoretical predictions.
• Students will demonstrate a skill to use PSpice to simulate the transient and frequency responses of a second-order circuit, and compare with experimental observations.
• Students will demonstrate a skill to use PSpice to simulate the diode circuits investigated in the lab, and compare with measured data.
• Students will demonstrate a skill to use PSpice to simulate the BJT and MOSFET amplifiers investigated in the lab, and compare with measured data.
• Students will demonstrate a skill to use PSpice to simulate the BJT and MOSFET logic circuits investigated in the lab, and compare with measured data.
• Students will demonstrate an ability in collecting, plotting, and interpreting experimental data, comparing with theoretical predictions, and accounting for discrepancies.
• Students will demonstrate a skill in the presentation of experimental results via effective graphic means, such as i-v characteristics, Bode Plots, voltage transfer curves, and waveforms.
• Students will demonstrate a skill in technical report preparation emphasizing both technical merit and effective writing.

b. explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
Course addresses ABET Student Outcome(s): a, b, c, e, g, k.

7. Brief list of topics to be covered
• Second-order step responses under various damping conditions; frequency responses, Bode Plots.
• Diode characteristics, and basic diode applications as rectifiers and regulators.
• Transistor (BJT and MOSFET) characteristics, and basic transistor applications as amplifiers and logic circuits.
• Computer simulation of diodes and transistor circuits using PSpice; comparison with experimental observations.