1. *Course number and name*
   ENGR 305: Systems Analysis

2. *Credits and contact hours*
   3 credit hours; three 50-minute lecture sessions/week, or two 1-hr-15-minute lecture sessions/week, depending on semester

3. *Instructor's or course coordinator's name*
   Instructor: Tom Holton, Instructor
   Course coordinator: Tom Holton, Professor of Electrical and Computer Engineering

4. *Text book, title, author, and year*
   Lathi, B.P. *Signal Processing and Linear Systems*., Berkeley-Cambridge Press, 2000

   a. *Other supplemental materials*
      Holton, T. *ENGR 305 Notes.* Available online at http://www.sfsu.edu/~ee/305. Username and password are given at the first lecture.

5. *Specific course information*
   a. *Brief description of the content of the course (catalog description)*
      Analysis of signals and systems in the time and frequency domains. Linearity and time invariance, causality and stability. Time-domain solutions of differential equations. Impulse response. Convolution. Fourier series and Fourier transform methods. Laplace transforms. System functions, Bode and pole-zero plots. System stability. Sampling theorem. Elements of discrete-time signal processing: discrete-time signals, convolution, difference equations, and z-transforms.

   b. *Prerequisites or co-requisites*
      MATH 245: Elementary Differential Equations and Linear Algebra
      ENGR 205: Electric Circuits.with a grade of C- or better

   c. *Indicate whether a required, elective, or selected elective course in the program*
      Required for Computer Engineering
      Required for Electrical Engineering
      Required for Mechanical 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.*
      - Students will demonstrate the ability to model physical systems by electrical analogs.
      - Students will demonstrate the ability to determine the linearity, time invariance, causality and stability of systems.

- Students will demonstrate the ability to use time-domain methods of solving differential equations to determine the impulse response.
- Students will demonstrate familiarity with convolution.
- Students will demonstrate the ability to determine Fourier series and Fourier transform of functions.
- Students will demonstrate the ability to determine Laplace transforms and inverse transforms.
- Students will demonstrate the ability to determine the system function, Bode plots and pole-zero plots.
- Students will have a familiarity with the sampling theorem.

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.

7. Brief list of topics to be covered

- Introduce basic concepts of signals and systems.
- Characterization of continuous-time signals.
- Modeling of physical systems by electrical analogs
- Linearity and time invariance.
- Causality and stability.
- Time-domain methods of analysis of linear systems.
- Impulse response. Convolution.
- Time-domain solutions of differential equations.
- Fourier series and Fourier transform methods.
- Laplace transform methods. Inverse Laplace transform. Laplace transform solution of differential equations.
- System functions. Bode plots. Pole-zero plots.
- Sampling theorem.
- Introduction to control theory, stability criteria, phase margin.