1. **Course number and name**
   EE 496: Introduction to Semiconductor Devices

2. **Credits and contact hours**
   3 credits, 3 lecture hours

3. **Instructor's or course coordinator's name**
   Deuk Heo and Mohamed Osman

4. **Textbook, title, author, and year**
   Chenming Hu. 2010. *Modern Semiconductor Devices for Integrated Circuits*. Prentice Hall. ISBN 978-0-13-608527.
   B. Streetman and S. Banerjee. 2006. *Solid State Electronic Devices* (6th ed.). Prentice Hall, ISBN 0-13-149726-X.

5. **Specific course information**
   a. Catalog description: Equilibrium statistics of electrons and holes; carrier dynamics; p-n junctions, metal-semiconductor junctions, BJTs, MOSFETs, LEDs, Fabrication processes.
   b. Prerequisites or co-requisites: None

6. **Specific goals for the course**
   At the end of the course, students will be able to
   - Understand various semiconductor devices and fabrication process (1).
   - Compute the device performance parameters (1).
   - Obtaining operating principles of semiconductor devices (1).
   - Understand and predict the impact of semiconductor devices on industry applications (1, 6).

7. **Brief list of topics to be covered**
   - Semiconductors and the parameters that control their characteristics
     - Crystal Structure, electrons, holes, energy gap and effective mass
     - Intrinsic vs extrinsic semiconductors
     - Direct band gap vs indirect band gap; Narrow vs wide band gap
   - Semiconductor statistics
     - Fermi –Dirac and Maxwell-Boltzmann Distributions
     - Density of states, Fermi levels
   - Transport in Semiconductors
     - Scattering processes, mobility and its temperature and doping level dependence
     - Drift and diffusion currents under the influence of electric field
     - Generation, recombination, recombination lifetimes
   - Semiconductor devices and their operation principles
     - PN Diodes, solar cells and Light emitting diodes
     - MOS Capacitors and CCDs
     - MOSFET and MOSFET Scaling issues

    - Bipolar Junction Transistors
- Semiconductor device and IC Fabrication processes
- Impact of semiconductors on energy, communication and computer aided design