Electrical Engineering Department
King Fahd University of Petroleum & Minerals

Course Number: EE 203
Course Title: Electronics 1 (Required Course)

Course Description :

Semiconductor Physics. PN junction physics and I/V characteristics. Diode application. BJT and FET Physics and I/V characteristics. Small Signal Amplifiers. Differential Amplifiers, structure, large signal and small signal characteristics. Digital families' characteristics (CMOS, PTL, TTL, ECL).

Prerequisites :

Electrical Circuit I (EE 201)

Textbook :

Sedra and Smith, *Microelectronic Circuit* (5th Edition), 2004, Oxford University Press, ISBN 0-19-514252-7.

Other useful references and material :

Richard Jaeger, and Travis Blalock, *Microelectronic Circuit Design,* 2nd Ed., McGraw Hill Education, 2004. ISBN 0072320990

Website: https://webcourses.kfupm.edu.sa/ or http://ocw.kfupm.edu.sa/

After successfully completing the course, the students will be able to
• Identify and characterize different semiconductor devices (P-N Junction, BJT, MOSFET, and JFET)
• Understand different diode and transistor applications (clipping, clamping, amplifier, ...)
• Analyze and design different electronic circuits contain semiconductor devices using devices' models.
• Identify the design parameters and different characteristics of small signal amplifiers
• Understand different digital families and get the required knowledge to select the proper family for a certain application

Topics Covered:

• PN junction (Diode) physics and I/V Characteristics
• Diode models and circuit analysis
• Diode applications (Rectifier, Limiters, Clampers, Power Supply)
• MOSFET structure and physical operation

- MOSFET I/V Characteristics and different operating regions.
- MOSFET DC analysis
- MOSFET as an amplifier and small signal analysis
- BJT structure and physical operation
- BJT I/V Characteristics and different operating regions.
- BJT DC analysis
- BJT as an amplifier and small signal analysis
- Differential Amplifiers structure and operation
- Digital circuits performance characteristics
- CMOS Inverter
- CMOS circuits design
- PTL and dynamic logic circuits analysis
- TTL and ECL families analysis

Class Schedule:

3 lectures per week, 50 minutes each and 3 hours lab per week.

Contribution of course to meeting the professional component:

The students will model electronic systems. The course will emphasize the use of analysis tools such as PSPICE to help analyze electronic circuits and systems, modifying the circuit and system behaviors to achieve the desired performance. Laboratory projects are designed to promote and strengthen spirit of multi-disciplinary team. The course project is intended to build the students' ability to design a system and its components.

Course Outcomes :

- An ability to apply knowledge of mathematics, science, and engineering to the analysis and design of electronic circuits
- An ability to identify, formulate, and solve engineering problems in the area circuits and systems.
- An ability to use the techniques, skills, and modern engineering tools such as VHDL and PFGA, necessary for engineering practice.
- An ability to conduct experiments, as well as to analyze and interpret data
- An ability to function on multi-disciplinary teams
- An ability to design a system, components or process to meet desired needs within realistic constraints such as economic, environmental, social political, ethical, health and safety, manufacturability and sustainability

Prepared by: Dr. Alaa El-Din Hussein, December 2006