JOINT INSTITUTE
交大密西根学院

Standard Undergraduate Course Profile

COURSE NUMBER: Ve311	**COURSE TITLE:** Electronic Circuits
CREDIT: 4	**PREREQUISITES:** Ve216
TEXTBOOKS/REQUIRED MATERIAL: 1. Richard C. Jaeger and Travis N. Blalock, Microelectronic Circuit Design, 4th edition, 2011, ISBN: 978-0071221993 2. Behzad Razavi, Design of Analog CMOS Integrated Circuits, 2nd edition, 2016, ISBN: 978-0072524932	**PREPARED BY:** Chang-Ching Tu **LAST UPDATED:** October 30, 2020 **DATE OF DISCIPLINE GROUP APPROVAL:** **DATE OF UC APPROVAL:**
CATALOG DESCRIPTION (No more than 100 words): Working principles of nonlinear semiconductor devices, including diode, BJT and MOSFET, and analog circuits based on those devices, such as voltage regulators, rectifiers, single stage amplifiers, current mirrors and differential pair amplifiers. Circuit analysis by hand-calculation with proper approximations. Comparison of hand-calculation results with Pspice simulation results. Building and analyzing circuits on simulation tool (such as Proteus) as well as on breadboard.	**COURSE TOPICS:** 1. Introduction to semiconductor physics 2. Working principles of silicon PN junction diodes 3. Analog circuits (e.g. voltage regulators and rectifiers) based on diodes 4. Working principles of BJTs 5. Analog circuits (e.g. common-emitter amplifiers) based on BJTs 6. Working principles of MOSFETs 7. Analog circuits (e.g. single stage amplifiers, current mirrors and differential pair amplifiers) based on MOSFETs
COURSE STRUCTURE and CONTACT HOUR: 42 hours of Lecture / 12 hours of Lab/ 6 hours of Discussion	
COURSE OUTCOMES [Student Outcomes* in brackets]	After completing Ve311, students should be able to do the following: 1. Build voltage regulators and rectifiers based on diodes and apply the constant voltage drop model to analyze them. [1, 2] 2. Build single stage amplifiers based on BJTs and MOSFETs. Find out the dc biasing conditions of the amplifiers. Estimate the dc voltage gains and input/output impedances of the amplifiers by small-signal analysis. [1, 2] 3. On the integrated circuit level, perform spice simulation to validate the hand-calculation results which are obtained by applying proper approximations. [1,2,5,6] 4. On the PCB level, design and analyze analog circuits by using PCB simulation tools (e.g. Proteus). Based on the simulation results, build the actual circuits on breadboard and use oscilloscope, function generator and multimeter to analyze the circuits. [1,2,5,6]
COURSE OBJECTIVES [Course Outcomes in brackets]	1. To teach students the working principles of silicon PN junction diodes. [1] 2. To teach students how to apply the constant voltage drop model of diodes to build and analyze voltage regulators and rectifiers. [1] 3. To teach students the working principles of BJTs and MOSFETs and their complete small-signal models. [2] 4. To teach students how to find out the dc biasing conditions of amplifiers by applying proper collector/drain current equations. [2] 5. To teach students how to find out the dc voltage gains and input/output impedances of amplifiers by small-signal analysis. [2] 6. To teach students how to obtain the dc voltage gains at certain dc biasing conditions from the dc sweep curves and time-resolved waveforms in Pspice. [3] 7. To teach students how to perform PCB simulation and how to use oscilloscope, function generator and multimeter to analyze the circuits on breadboard. [4]
ASSESSMENT TOOLS [Course Outcomes in brackets]	1. Homework assignments [1,2,3] 2. Lab reports [1,2,4] 3. Midterm exam [1,2] 4. Final exam [1,2]