20-SECS-2070	Electronics I
Required/Elective:	Required for EE and CompE majors
Catalog Data:	20EECS-2070. Electronics I. Credits 3. Operational amplifiers, nonlinear circuits, linear amplifiers, bipolar and field-effect stages, differential and multistage amplifiers; use of MATLAB and PSpice.
Prereqs by Topic:	Prerequisites: 2050C, Corequisites: 2070L Kirchhoff's current and voltage laws, RC, RL and RLC network analysis, phasors, sinusoidal steady-state analysis
Textbook:	Donald A. Neamen, *Electronic Circuit Analysis and Design,* McGraw-Hill, latest edition.
References:	Instructor notes
Goals:	Analog circuit analysis for bipolar and field-effect transistors and circuit design including single, differential and multistage amplifiers and use of operational amplifiers and power amplifiers.
Lecture Topics:	Weekly activities and assignments: 1. Amplifiers and circuit models, Thévenin and Norton equivalents 2. Introduction to operational amplifier circuit characteristics and use 3. Diode characteristics, equivalent circuit models and circuit analysis 4. Field-effect transistors and their characteristics (JFETs, MOSFETs) 5. FET biasing and analysis and amplifier design 6. Bipolar junction transistor characteristics 7. BJT biasing and analysis and amplifier design 8. Differential amplifiers 9. Multistage amplifier analysis and design 10. Power amplifiers 11. Operational amplifiers – operation and characteristics – intro to active filters 12. Advanced op amp design. 13. 3 midterms + final
Laboratory Topics:	None. Separate but coordinated course.
Class/Laboratory Schedule:	Class meets 3 times per week for 55 minutes.
Course Learning Objectives:	Students will: 1. Understand the four basic types of amplifiers and their equivalent circuits, the forms of gain, and the factors that define amplifier performance including linearity and saturation (a,c,e) 2. Comprehend and be able to apply network analysis techniques to analyze operational amplifier circuits, diode circuits, single-stage bipolar transistor amplifiers, and single-stage FET transistor amplifiers (a,c,e) 3. Be able to analyze differential and multi-stage transistor amplifiers, including determination of the DC bias (quiescent) point and associated small-signal parameters for each transistor; construction of small- signal equivalent circuits to determine the voltage, current or power gain of the amplifier; and determination of the input and output resistances (a,c,e) 4. Be able to design a basic power amplifier (a,c) 5. Be able to use MATLAB and PSpice to simulate and analyze amplifiers (k)
Outcomes:	a, c, e, and k
Contribution to Professional Component:	Engineering science: 2 credits (66%) Engineering design: 1 credit (34%)

Prepared by:	Marc Cahay, Ph.D.	**Date:**	July 15, 2015
Approved by Undergraduate Council:			