The University of Texas at Tyler  
Department of Electrical Engineering  

Course: EENG 3306 – Electronic Circuit Analysis I (Required)  

Syllabus  

Catalog Description:  
Introduction to semiconductor devices; junction diode characteristics; analog diode circuits; Bipolar Junction Transistor (BJT) and Field Effect Transistor (FET) characteristics and models; transistor biasing and low frequency amplifier analysis and designs; multi-stage amplifiers, nonlinear (harmonic) distortion; transistor audio amplifiers.  

Prerequisites:  
EENG 3304 (Linear Circuits Analysis I); EENG 3104 (Linear Circuits Analysis I Laboratory)  

Credits:  
( 3 hours lecture, 0 hours laboratory per week )  

Text(s):  

Additional Material:  
Access to PSpice, Excel, and MATLAB  

Course Coordinator:  
David M. Beams, Associate Professor of Electrical Engineering  

Topics Covered:  (paragraph of topics separated by semicolons)  
Generalized amplifier models; applications of operational amplifiers; non-ideal characteristics of operational amplifiers; electrical characteristics, small-signal models and applications of diodes; small-signal models and applications of bipolar junction transistors; small-signal models and applications of FETS; amplifier analysis and design; h-parameter representations of amplifiers; distortion and limitation of small-signal models.  

Evaluation Methods: (only items in dark print apply):  
1. Examinations / Quizzes  
2. Homework  
3. Report  
4. Computer Programming  
5. Project  
6. Presentation  
7. Course Participation  
8. Peer Review  

Course Objectives: By the end of this course students will be able to:  
1. Demonstrate knowledge of basic electrical concepts: circuit analysis techniques, description of signals in time and frequency, frequency response, and decibel notation.  
2. Demonstrate ability to use amplifier models (voltage, current, transconductance, and transimpedance) in circuit analysis.  
3. Analyze electrical circuits represented by two-port parameters.  
4. Analyze circuits using operational amplifiers including the limitations imposed by non-ideal electrical characteristics.  
5. Use knowledge of electrical characteristics of ideal and real diodes under forward and reverse bias to analyze and design diode-application circuits—e.g., rectifiers, clipping circuits, and Zener-diode voltage regulators.  
6. Analyze transistor amplifier using midband small-signal models.  
7. Use the operational principles and electrical characteristics of bipolar junction transistors (BJTs) to determine the quiescent operating point of a BJT.  
8. Use the operational principles and electrical characteristics of bipolar junction transistors
to derive appropriate small-signal models (including $h$-parameter models) and utilize these models in the analysis of basic amplifier circuits.

9. Use the operational principles and electrical characteristics of MOSFETs to determine the quiescent operating point.

10. Use the operational principles and electrical characteristics of MOSFETs to derive the appropriate small-signal model and utilize this model in the analysis of basic amplifier circuits.

11. Calculate the limits of small-signal operation of diodes, bipolar transistors, and MOSFETs from their $V-I$ characteristics.

Relationship to Program Outcomes (only items in dark print apply)$^2$: This course supports the following Electrical Engineering Program Outcomes, which state that our students will:

1. have the ability to apply mathematics, science, and engineering principles in the practice of electrical engineering; [1 - 90] (2)
2. have the ability to use modern engineering tools and techniques in the practice of electrical engineering; [1 - 9] (2)
3. have the ability to analyze electrical circuits, devices, and systems; [1 - 9] (3)
4. have the ability to design electrical circuits, devices, and systems to meet application requirements; [1 – 9)] (2)
5. have the ability to design and conduct experiments, and analyze and draw conclusions from experimental results;
6. have the ability to identify, formulate, and solve problems in the practice of electrical engineering using appropriate theoretical and experimental methods; [1 - 9] (1)
7. have effective written, visual, and oral communication skills
8. possess an educational background to understand the broader context in which engineering is practiced, including:
   a. knowledge of contemporary issues related to science and engineering;
   b. the impact of engineering on society;
   c. the role of ethics in the practice of engineering;
9. have the ability to contribute effectively to multi-disciplinary engineering teams;
10. have a recognition of the need for and ability to pursue continued learning throughout their professional careers.

$^2$ Numbers in brackets refer to course objective(s) that address the Program Outcome. Numbers in **Bold** indicate the extent to which this course supports the listed program outcome. Scale:

1 = program outcome is a minor focus of this course; 2 = program outcome is a significant focus of this course; 3 = program outcome is a major focus of this course.

Contribution to Meeting Professional Component: (in semester hours)

<table>
<thead>
<tr>
<th>Mathematics and Basic Sciences:</th>
<th>0 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Sciences and Design:</td>
<td>3 Hours</td>
</tr>
<tr>
<td>General Education Component:</td>
<td>0 Hours</td>
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</tbody>
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Prepared By: David M. Beams  Date: August 9, 2011