Master Course Syllabus for EEL 4306L

1. **Department:** ELECTRICAL AND COMPUTER ENGINEERING

2. **Title:** Electronic Circuits II Laboratory  
   **Credits:** 1.0

3. **Course Designation as Elective or Required:** Required

4. **Catalog Description:** Electronic instrumentation devices and systems.

5. **Prerequisite(s):**  
   EEL 3304: Electronic Circuits I, with a grade of 'C' or higher.  
   EEL 4304L: Electronic Circuits I lab, with a grade of 'C' or higher.

   **Co-requisite(s):**  
   EEL 4306: Electronic Circuits II.

6. **Textbook(s) and/or Other Required Materials:**  

7. **Course Objectives:**  
   - Apply the theoretical principles learned in the practical design of multiple transistor circuits.  
   - Apply the theoretical principles learned in the practical design of feedback amplifiers and of electronic filters.  
   - Learn the practical implementation of Power Amplifiers and Oscillators.  
   - Experimentally study the Operational Amplifier and the open loop response.  
   - Experimentally study the fundamental Op-Amp applications.

8. **Student Learning Outcomes:**  
   - Develop student’s ability to design and conduct experiments.  
   - Develop student’s ability to design electronic circuits to meet certain specifications.  
   - Foster basic analog electronic circuit design techniques and analytical skills using multiple transistor circuits and Op-Amps.  
   - Apply basic engineering science to the design, analysis and operation of Active Filters, circuits with Feedback, and Power Amplifiers.  
   - Use modern simulation tools such as PSpice in the design, analysis, and performance evaluation of Frequency Response and of Feedback Circuits.  
   - Develop problem solving skills for design of electronic circuits in order to meet desired specifications.

9. **Topics Covered:**
<table>
<thead>
<tr>
<th>Week</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Design of Multiple Transistor Circuits (1)</td>
</tr>
<tr>
<td>3</td>
<td>Design of Multiple Transistor Circuits (2)</td>
</tr>
<tr>
<td>4</td>
<td>Design of Mixed Op-Amp / Transistor Circuits</td>
</tr>
<tr>
<td>5</td>
<td>Waveform Generation with Op-Amps</td>
</tr>
<tr>
<td>6</td>
<td>Design of an Op-Amp Oscillator</td>
</tr>
<tr>
<td>7</td>
<td>Design of a Precision Rectifier</td>
</tr>
<tr>
<td>8</td>
<td>Frequency Response of Op-Amp Circuits</td>
</tr>
<tr>
<td>9</td>
<td>Design of a Multi-stage JFET Amplifier</td>
</tr>
<tr>
<td>10</td>
<td>Design of a Butterworth Active Filter</td>
</tr>
<tr>
<td>11</td>
<td>Design of an IC Amplifier</td>
</tr>
<tr>
<td>Total</td>
<td>10 labs</td>
</tr>
</tbody>
</table>

**Computer Resources:** Students are required to use PSpice for comparing computer-simulated results with those of laboratory measurements.

10. **Class/Laboratory Schedule:**
One lab of 2 hours’ 45 minutes per week. The labs are coordinated with the electronic circuits II course, EEL 4306.

11. **Design and Conduct Experiments:**
Students should exercise judgment and discretion in setting up the experiment, how measurements are to be taken, and how to interpret the measured data. They should also take personal responsibility for the completion of the experiment. The lab report should include the following:

**Purpose:** Design and conduct experiments to verify a pre-lab design to meet certain specifications.

1. Description of the selection of components including tolerances and cost.
2. Block diagram description of the complete setup for testing.
3. Descriptions of all connections for all measuring equipment and instruments, including their functions.
4. Taking the measurements of desired outputs and recording the data.
5. Comparing the results with the expected specifications.
6. Analysis and interpretation of the data given the possibility of variation and other practical limitations.
7. Description of the sensitivity of the components on the outcome. Which component is the most sensitive in terms of obtaining the desired results most effectively?
8. Description of the adjustments made to meet the desired specifications.
9. Description of the safety issues considered while conducting the experiment.
10. Description of the process used to design and conduct the experiment.
11. Conclusion.

12. **Contribution to Meeting Professional Component:**
The course introduces and emphasizes the design of a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
Design/Science Content:
ABET Science: 0.5 credits or 50%
ABET Design: 0.5 credits or 50%

13. Relationship to Program Objectives:

<table>
<thead>
<tr>
<th>#</th>
<th>Program Objectives</th>
<th>Check if related</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a.</td>
<td>Develop electrical engineering solutions individually and through interdisciplinary teams within a global and societal context.</td>
<td>x</td>
</tr>
<tr>
<td>1b.</td>
<td>Develop computer engineering solutions individually and through interdisciplinary teams and act accordingly within a global and societal context</td>
<td>x</td>
</tr>
<tr>
<td>2.</td>
<td>Professionally and ethically, engage in technical or business activity through engineering ability, communication skills, and knowledge.</td>
<td>x</td>
</tr>
<tr>
<td>3.</td>
<td>Continue professional growth through post-graduate education, continuing education, or professional activity.</td>
<td>x</td>
</tr>
<tr>
<td>4.</td>
<td>Contribute to the Northwest Florida regional economic development.</td>
<td>x</td>
</tr>
</tbody>
</table>

14. Relationship to Program Outcomes:

Program Outcomes: 3, 5, 6, 7 & 10  
(see [http://uwf.edu/ece/about/CEOutcomes.pdf](http://uwf.edu/ece/about/CEOutcomes.pdf)  [http://uwf.edu/ece/about/EEOutcomes.pdf](http://uwf.edu/ece/about/EEOutcomes.pdf)):

<table>
<thead>
<tr>
<th>#</th>
<th>Program Outcomes</th>
<th>How do you achieve the outcomes?</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Core electrical and computer engineering topics.</td>
<td>PSpice software simulations for design verification.</td>
</tr>
<tr>
<td>3.</td>
<td>Use the techniques, skills, and modern engineering tools.</td>
<td>Design of experimental simulations is applied in the analysis and assembly of electronic circuits.</td>
</tr>
<tr>
<td>4.</td>
<td>Apply knowledge of mathematics, science, and engineering.</td>
<td>Students design multi-transistor circuits as well as mixed Op-amp / transistor circuits. The designs must meet certain specifications for manufacturability and sustainability, including worst-case analysis.</td>
</tr>
<tr>
<td>5.</td>
<td>Design and conduct experiments, as well as to analyze and interpret data.</td>
<td>Students design multi-transistor circuits as well as mixed Op-amp / transistor circuits. The designs must meet certain specifications for manufacturability and sustainability, including worst-case analysis.</td>
</tr>
<tr>
<td>6.</td>
<td>Probability and statistics, including applications.</td>
<td>Students design multi-transistor circuits as well as mixed Op-amp / transistor circuits. The designs must meet certain specifications for manufacturability and sustainability, including worst-case analysis.</td>
</tr>
<tr>
<td>7a.</td>
<td>Identify, formulate, and solve engineering problems.</td>
<td>Students design multi-transistor circuits as well as mixed Op-amp / transistor circuits. The designs must meet certain specifications for manufacturability and sustainability, including worst-case analysis.</td>
</tr>
<tr>
<td>7b.</td>
<td>Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.</td>
<td>Students design multi-transistor circuits as well as mixed Op-amp / transistor circuits. The designs must meet certain specifications for manufacturability and sustainability, including worst-case analysis.</td>
</tr>
<tr>
<td>8.</td>
<td>Major design experience based on the knowledge and skills acquired in earlier course work.</td>
<td>Students design multi-transistor circuits as well as mixed Op-amp / transistor circuits. The designs must meet certain specifications for manufacturability and sustainability, including worst-case analysis.</td>
</tr>
<tr>
<td>9.</td>
<td>Incorporated appropriate engineering standards and multiple realistic constraints.</td>
<td>Students design multi-transistor circuits as well as mixed Op-amp / transistor circuits. The designs must meet certain specifications for manufacturability and sustainability, including worst-case analysis.</td>
</tr>
<tr>
<td>10.</td>
<td>Function on multi-disciplinary teams.</td>
<td>Students design multi-transistor circuits as well as mixed Op-amp / transistor circuits. The designs must meet certain specifications for manufacturability and sustainability, including worst-case analysis.</td>
</tr>
<tr>
<td>11a.</td>
<td>Professional and ethical responsibility.</td>
<td>Students design multi-transistor circuits as well as mixed Op-amp / transistor circuits. The designs must meet certain specifications for manufacturability and sustainability, including worst-case analysis.</td>
</tr>
<tr>
<td>11b.</td>
<td>The impact of engineering solutions in a global, economic, environmental, and societal context.</td>
<td>Students design multi-transistor circuits as well as mixed Op-amp / transistor circuits. The designs must meet certain specifications for manufacturability and sustainability, including worst-case analysis.</td>
</tr>
</tbody>
</table>
12. Recognition of the need for, and an ability to engage in lifelong learning. It requires ability to use library, critique journals articles, synthesize materials from different sources, and figure out where to go for new information.


14. Fundamental theory and practice of science and engineering, as it applies to hardware and software, and identify the interaction between hardware and software.

15. Design a complete system (hardware and software).

15. **Expectations for Academic Conduct/Plagiarism Policy:**
   - Academic Conduct Policy: [http://uwf.edu/cas/aasr/academic_conduct.pdf](http://uwf.edu/cas/aasr/academic_conduct.pdf)
   - Plagiarism Policy: [http://uwf.edu/cas/aasr/Plagiarism.pdf](http://uwf.edu/cas/aasr/Plagiarism.pdf)
   - Student Handbook: [http://www.uwf.edu/uwfmain/stuHandbk/](http://www.uwf.edu/uwfmain/stuHandbk/)

16. **Assistance:**
   - Students with special needs who require specific examination-related or other course-related accommodations should contact Barbara Fitzpatrick, Director of Disabled Student Services (DSS), dss@uwf.edu, (850) 474-2387. DSS will provide the student with a letter for the instructor that will specify any recommended accommodations.

17. **Prepared by:** Dr. Steve Gorman, Date: November, 2004
    Revised by: Dr. Ezzat G. Bakhoum, Date: November 20, 2006
Other Information Related to the Course

Instructor: Dr. Ezzat G. Bakhoum
Tel. No: 474-3373
Email: ebakhoum@uwf.edu
Office location: Building 70, Room 142
Office Hours: TBD

Course and Lab Policies

The following policies must be strictly adhered to. Please read carefully:

1) Use of the cell phone is absolutely not allowed in the lab. This includes talking on the phone and the sounds generated by the phone, such as ringing or music. If you must receive calls while in the lab, please put your phone on the "vibrate" mode. When the call comes, leave the room quietly and talk outside. Violators will be given a warning for the first two occurrences. On the third occurrence, I will report your name to the Dean's office and request that a disciplinary action be taken against you. Please do not force us and force yourself into this kind of situation. Your cooperation will be appreciated.

2) University policies prohibit smoking, eating, or drinking in the laboratory. Due to the presence of sensitive electronic equipment in the lab, liquids are particularly unwanted as accidental spills may result in serious consequences. Students are also asked to refrain from offensive behavior and language (no matter how frustrating a lab experiment may be). Students are expected to clean up their station from all the wire strips, paper, etc. Leave your station as clean as you found it if not cleaner. Your cooperation with the lab procedures and rules will be appreciated. Each student must read the complete UWF-ECE Laboratory Policy Manual, sign a consent form and submit to the lab instructor on the second day of the lab session.

3) The following concerns the lab reports and attendance of the lab: in general, make-up lab sessions or the submission of late lab reports are not allowed. Excuses such as "the dog ate my report" or "my mother was sick" will not be accepted. If, however, a valid emergency that prevents you from attending a lab session or submitting a report on time does indeed occur, you need to see me immediately and provide a convincing evidence. The lab session or the report must then be scheduled or submitted within one week (except in grave circumstances that can be verified).

4) Evidence of cheating in a lab report will be reported to the Dean's office immediately without any warning. In addition, your grade for the report will be the following: Zero.

Lab Report
A lab report should be written in such a way that anyone with your educational background can understand what s/he’s reading and be able to replicate the same experiment. The reports must be typed and submitted electronically to the class drop box on the FTP server (ftp://ftp.ece.uwf.edu/EEL4306L). The reports must be in MS Word or pdf format. Each report must include the student name and email address at the top of the first page. Reports that are submitted to the instructor via email will not be graded. All lab reports should have at least the following sections unless otherwise specified (a sample report can be found on the class ftp folder (ftp://ftp.ece.uwf.edu/EEL4306L/CourseInfo/)

**Cover Page**
It must include your name, email address, course title, lab number, lab title, and experiment date.

**Objective(s)**
This should be a small paragraph not exceeding 4 or 5 sentences to point out the main purpose of the lab.

**Introduction/Background/Theory**
This section talks about the background and/or theory of the assignment and gives a brief and precise description of what you are trying to design/build.

**Procedure**
This section discusses your lab work in details. It should contain the specifications of your design, schematics, code, etc.

**Conclusion**
The conclusion that you draw after doing this experiment, whether or not you were able to achieve your goal, problems encountered, how you could have done it better, etc.

**Questions (if any)**
Answers to the questions (if any) asked at the end of the lab assignment.

**Grading Scheme**
Attendance: 50%, Lab Reports: 50%. You must score at least 70% to pass this lab course.

The following will be the relationship between your final grade and your numerical score: 93% or higher = A, 90%-92% = A-, 87%-89% = B+, 83%-86% = B, 80%-82% = B-, 75%-79% = C+, 70%-74% = C, 65%-69% = C-, 60%-64% = D+, 55%-59% = D, 50%-54% = D-, Below 50% = F.

WITHTHDRWAL DATE: MARCH 21, 2007
WITHTHDRWAL DEAD LINE: APRIL 24, 2007 with Instructor’s Permission

Syllabus for EEL 4306L