COURSE SYLLABUS

AC Circuits

CETT-1305
Number

1-6-3
Lecture - Lab - Credit

CETT-1303
Prerequisite

This syllabus has been reviewed and is current on the date indicated.

Prepared By

Jeff Olney
Instructor

12/16/14
Date

Reviewed By

Mike Haigood
Instructional Director

12/22/14
Date
Instructor Information

Name: Jeff Olney
Phone: 325-235-7477

Campus Office: Sweetwater TDC 115
email: jeff.olney@tstc.edu

Office Hours: F: 11a-5p
Advisement Hours: F:11a-5p

Department Chair: Heath Ince
Chair email: thince@tstc.edu

II. Class Times, Location
CETT-1305
LEC 4TDC 142 M 8:00-8:55AM
LAB 4ACT 117 T,W,TH 8:00-9:55AM

III. Program Outcomes
(Wind Energy Technology)
A. The Wind Energy Technology student will demonstrate competent skills needed to maintain and repair electrical systems of wind turbines.
B. The Wind Energy Technology student will demonstrate competent skills in maintaining and repairing mechanical systems of wind turbines.
C. The Wind Energy Technology student will demonstrate competency in practicing safety skills in responding to hazards associated with wind turbines.
D. Demonstrate the concepts of supervisory control and data acquisition (SCADA) systems, basic Smart Grid Technology and data communications related to wind turbines.

(Applied Engineering Technology)
A. The Applied Engineering Technology student will demonstrate competency in installing, analyzing, maintaining, and troubleshooting equipment used in an automated manufacturing process.
B. The Applied Engineering Technology student will demonstrate competency in identifying and applying safe working practices and procedures.
C. The Applied Engineering Technology student will demonstrate effective techniques for troubleshooting electrical, electronic, and mechanical and computer system problems.

IV. Course Description & Introduction
A study of the fundamentals of alternating current including series and parallel AC circuits, phasors, capacitive and inductive networks, transformers, and resonance.
V. Learning Outcomes

The student will:

A. Solve Basic mathematical problems using scientific and metric numbering systems
   - Add, subtract, multiply, and divide using the scientific numbering system.
   - Add, subtract, multiply, and divide using the metric numbering system.
   - Convert between the scientific and metric systems using the proper metric prefix.

B. Solve problems associated with charged bodies and current and voltage
   - Transpose mathematical calculations between the scientific and metric systems and use the common metric prefixes and engineering notations to express quantities in electrical systems.
   - Analyze the nature of electricity.
   - Explain current flow (conventional and electron).
   - Differentiate between voltage and current.
   - Explain what causes current to move through a conductor.
   - Manipulate equations and make calculations involving charged bodies current and voltage.

C. Solve problems associated with conductance and resistor tolerances
   - Select proper resistors for specific application using the color code and wattage rating.
   - Calculate the current in a series circuit given resistance and applied voltage.
   - Explain the relationship between resistance, current flow and voltage drops in an electric circuit.
   - Calculate the amount of resistance necessary to drop a voltage to a desired level.
   - Manipulate equations and solve problems using Ohm’s law.
   - Determine and use the proper prefixes associated with electronic terms (Powers of ten expressed in units of 3).

D. Define Ohm's law and use it to solve for resistance, current, and voltage
   - Determine and use proper prefixes associated with electronic terms.
   - Define a series circuit.
   - Calculate total resistance total current and the polarity of the IR drops in series circuits.
   - List the power distribution rules for series circuits.
   - Analyze the effects of shorts and opens in series circuits (troubleshooting).

E. Identify and solve problems associated with both, series and parallel circuits
   - Define a parallel circuit.
   - Develop methods of determining total current in parallel circuits.
   - Develop methods of determining total resistance in parallel circuits.
   - Analyze power distribution in parallel circuits.
   - Construct parallel circuits and make measurements to verify calculations.
   - Analyze the effects of opens and shorts in parallel circuits (troubleshooting).

F. Accurately read analog and digital multi-meters and install them properly in circuits so they may be used for circuit analysis
   - Analyze the function and different types of conductors.
   - Describe the relationship between wire size (diameter) and wire gauge (AWG).
   - Differentiate between a good insulator and a good conductor.
   - Explore the use of switches and safety devices in electrical circuits.
G. Identify different types of batteries and describe their proper application
   • Analyze general features of batteries.
   • Analyze the relationship between internal and load resistance and load current and power transfer.
   • Construct circuits and measure voltages and currents to validate mathematical analysis of above circuits.

H. Analyze the relationship between a current carrying conductor and the magnetic field surrounding the conductor
   • Analyze the application of the left hand rule for electromagnetism.
   • Analyze the application of Faraday’s and Lenz’ laws and motor and generator action.
   • Recognize the properties of electromagnetic induction.
   • Explore the relationship between an electric current and the magnetic field surrounding the current.
   • Analyze motor action between two magnetic fields.
   • Determine the factors that affect induced current in a conductor within a magnetic field.
   • Analyze the process of inducing a voltage across a coil.

I. Analyze the principles of AC generation
   • Consider AC from the aspects of frequency, angular velocity, period, and wavelength.
   • Recognize the difference between AC and DC symbols.
   • Determine peak to peak, peak, average and effective (RMS) values of sine wave voltages and currents.
   • Differentiate between the various types of AC voltages (non-sinusoidal).

J. Define capacitance and analyze the effects of capacitor in both AC and DC circuits
   • Analyze charging and discharging a capacitor and the Farad unit of capacitance.
   • Calculate total capacitance in series and parallel connected capacitors.
   • Evaluate the electrostatic field of capacitance and stray capacitance and inductance.
   • Explain troubles in capacitors

K. Define inductance
   • Discuss the mutual effects of two closely associated coils.
   • List factors affecting inductance and determine total inductance in series and parallel connected inductors.
   • Analyze induction as it relates to AC current.
   • Explore transformer applications and the different types of transformers.
   • Calculate turns ratios for transformers in voltage step-up, step-down and impedance matching applications.
   • Determine total inductance in circuits containing series and parallel inductors.
   • Discuss common troubles in coils and transformers.

Students may vary in their competency levels on these abilities. You can expect to acquire these abilities only if you honor all course policies, attend classes regularly, complete all assigned work in good faith and on time, and meet all other course expectations of you as a student.
VI. Assessment Methods & Grading Policy

General
Students will be assessed by homework assignments, written test, lab work and a lab final (hands-on) exam along with a comprehensive written final exam.

Submittals
All work; assignments, labs and etc. should be legibly written in No. 2 pencil and should be submitted on clean edge, college rule, 8.5” x 11”, notebook paper or from the lab manual. Assignments submitted otherwise will be returned un-graded and considered late.

Labs and exams which are missed because of an absence cannot be made-up unless arrangements are made prior to the absence.

Homework and other Assignments
Homework and/or other assignments are due at the beginning of class on the date they are due or they are due at the time set in Moodle. Assignments turned-in after the beginning of class are considered late. Assignments are penalized 30 points for each day (24 hours) late. Assignments over 3 days late will not be accepted and a grade of zero will be given.

Labs
The student will actually perform a given task. These assessments are designed to assess the hands-on skill sets you are to obtain in this course.

Students are responsible for all equipment at their lab stations, including hand tools and meters. Lab areas should be kept clean and free of trash at all times.

Quizzes
Students should be prepared at all times for a quiz on assigned material.

Job Hazard Analysis
A Job Hazard Analysis (JHA) will be conducted at the beginning of each lab. You must participate in all of the first JHA to get credit for the JHA that day. Students who are late to lab must participate in a make-up JHA before working in the lab that day, but will receive a zero for the JHA grade for that day.

Exams
Exams will be given at least every two weeks or sooner depending on material covered.

Midterm Exam
A comprehensive written midterm exam will cover all the material covered in class and lab up to a specific point.

Written Final
A comprehensive written final, will cover all the material covered in class and lab throughout the semester.

Hands-On Final
A hands-on final will be given in this class. This final allows the student to demonstrate the hands-on skills developed in the class.

Grading Policy

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.66%</td>
<td>Daily Participation</td>
</tr>
<tr>
<td>16.66%</td>
<td>Homework/ Quiz’s,</td>
</tr>
<tr>
<td>16.66%</td>
<td>Laboratory Assessments</td>
</tr>
<tr>
<td>16.66%</td>
<td>Midterm/Section Exams</td>
</tr>
<tr>
<td>16.66%</td>
<td>Written Final</td>
</tr>
<tr>
<td>16.66%</td>
<td>Hands-On Final</td>
</tr>
<tr>
<td>100%</td>
<td>Grade</td>
</tr>
</tbody>
</table>

A grade of 70 is the minimum passing grade for this class.
VII. **Textbook/Reference Materials**  
Textbook: *GROB’S BASIC ELECTRONICS*, Schultz  

VIII. **Additional Resources & Supplies**  
Safety Toe Boots  
Electronics Lab Kit  
Scientific Calculator (WET Students) using a cell phone as a calculator will not be allowed during exams  
Graphing Scientific Calculator (AET students) using a cell phone as a calculator will not be allowed during exams  
Electrical Trainers (provided by TSTC)  
Bench Meters (provided by TSTC)  
Hand Tools (provided by TSTC)  

IX. **Class Participation Policy & Student Conduct Attendance**  
Regular attendance is necessary for satisfactory achievement of the material presented in this class. Therefore, it is the responsibility of the student to attend lecture and laboratory sessions in accordance with requirements of the course as established and communicated by the instructor. A student who fails to meet these class participation requirements will earn a failing grade (F) in the course.  
The instructor is not required to provide the student with missed lecture material if he/she does not attend the class/lab session.  
Instructors cannot drop students or award grades of ‘W’ for students based on non-attendance.  
Labs and exams which are missed because of an absence cannot be made-up unless arrangements are made prior to the absence.  

**Punctuality**  
Class starts promptly at the assigned time. Students are expected to be in class and prepared at that time: have paper, pencil, textbook, calculator, etc. Any student that does not show up to class on time and prepared for class will be docked 50 points on their daily participation grade. Also a quiz may be given at the beginning of class, and students who are not in the classroom when class starts will not be allowed to take the quiz and will receive a grade of zero for the quiz.  

**Behavior**  
In the classroom and/or lab, just as in the work place, students are expected to behave in the appropriate manner. It is also vital that students learn to adapt behaviors to fit different environments and situations.  
If your behavior is not acceptable the Instructor or Lab Assistant will ask you to modify it and a disciplinary action notice will be sent to the Dean of Students explaining the problem. If your behavior is not acceptable a second time, the Instructor or Lab Assistant will ask you to leave the classroom and report to the Dean of Students to be dropped from the course. Frustration is a common source of inappropriate behavior. Be aware of stressful times, i.e. midterm exams, end of a semester finals, etc.  
Appropriate behavior includes the use of suitable language in the classroom/lab. Absolutely no vulgar or abusive language will be permitted anywhere within the confines of the learning environment. This includes, but is not limited to, laboratory and class areas, break areas, hallways, offices and entrances to the buildings. Inappropriate
language will not be tolerated and will be dealt with in the same manner as inappropriate behavior.

If you need help understanding appropriate behavior, please ask the instructor.

**Cell Phones**
The use of cell phones, MP3’s, etc is not allowed in the classroom or lab, **if you are caught using a cell phone in class you will be asked to leave and a grade of zero will be given for your daily participation grade.** Use of a cell phone in lieu of a calculator is not allowed during exams.

X. **Safety**
- Campus building occupants are required to evacuate buildings when a fire alarm activates. Alarm activation or announcement requires exiting and assembling outside.
- Familiarize yourself with all exit doors of each classroom and building you may occupy while receiving instructions. The nearest exit door may not be the door you used when entering the building.
- Students requiring evacuation assistance should inform the instructor during the first week of class.
- In the event of evacuation, follow the faculty’s or class instructor’s instructions.
- **Do Not** re-enter a building unless given instructions by the Fire Department, Campus / Local Police, or Fire Prevention Services.

In the classroom and lab, just as in the worksite, safety is a top priority. The attached Applied Engineering Technology Lab Safety Policy will be adhered to in the strictest of manner. The display of any unsafe activity may result in immediate dismissal from class that day with a grade of zero for that activity or assignment. Repeated unsafe activity by a student will result in removal from class with a grade of “F”.

All students are responsible to read, understand and acknowledge the Applied Engineering Technology Lab Safety Policy.

XI. **Special Needs**

If you have a documented disability that will impact your work in this class, please contact the ADA Coordinator, so that appropriate arrangements for your accommodations can be made. The counselor on your campus can assist you in this process. In accordance with the federal law, a student requesting accommodations must provide documentation of his/her disability to the ADA Coordinator. For more information call (325) 236-8292 or email amy.freeman@tstc.edu.
XII. Course Schedule

The following Activities / Assignments are subject to change; however, reasonable notice will be given.

<table>
<thead>
<tr>
<th>End-Of-Course Learning Outcomes</th>
<th>Activities/Assignments</th>
<th>Due Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week #1: Chapter 13</td>
<td>Describe the magnetic field surrounding a magnet. Define the units of magnetic flux and flux density. Convert between magnetic units</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Read: Grob text chapter 13</td>
<td>Within first 2 days of class</td>
</tr>
<tr>
<td>Lab: Assigned at end of lecture</td>
<td></td>
<td></td>
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</tbody>
</table>

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<tbody>
<tr>
<td>Week #2: Chapter 14</td>
<td>Define the terms magnetomotive force and field intensity and list the units of each. Explain the B-H magnetization curve. State Lenz’s Law</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Read: Grob chapter 14</td>
<td>Before the start of Lecture</td>
</tr>
<tr>
<td>Lab: Assigned at end of lecture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skill Validation 1 &amp; 2</td>
<td>Written Test: Covering series parallel circuits and loaded voltage dividers</td>
<td>End of week #2</td>
</tr>
</tbody>
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<tr>
<td>Week #3: Chapter 15</td>
<td>Describe how a sine wave or alternating voltage is generated. Calculate the instantaneous value of a sine wave of alternating voltage or current</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Read: Grob Chapter 15</td>
<td>Before the start of lecture</td>
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<tr>
<td>Lab: Assigned at end of lecture</td>
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</tbody>
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<tbody>
<tr>
<td>Week #4: Chapter 16</td>
<td>Explain how charges is stored in a dielectric of a capacitor. Explain how a capacitor charges and discharges. Define the unit of capacitance. List the physical factors affecting the capacitance of a capacitor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Read: Grob chapter 16 &amp; 17</td>
<td>Before the start of lecture</td>
</tr>
<tr>
<td>Lab: Assigned at end of lecture</td>
<td></td>
<td>End of week #4 lab session</td>
</tr>
<tr>
<td>Skills Validation 3&amp;4</td>
<td>Written Test</td>
<td>End of week #4</td>
</tr>
</tbody>
</table>

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<tbody>
<tr>
<td>Week #5: Chapter 18</td>
<td>Analyze the phase relationships between current, voltage and impedance in circuits containing resistance and capacitive reactance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Read: Grob Chapter 18</td>
<td>Before the start of Lecture</td>
</tr>
<tr>
<td>Labs: Labs 18-1 and 18-2 Grob Experiment book</td>
<td>End of week #5 lab session</td>
<td></td>
</tr>
<tr>
<td>End-Of-Course Learning Outcomes</td>
<td>Activities/Assignments</td>
<td>Due Dates</td>
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<tr>
<td>Explain the concept of self-inductance</td>
<td>Read: Grob Chapter 19</td>
<td></td>
</tr>
<tr>
<td>Define the henry unit of inductance and define mutual inductance</td>
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</tr>
</tbody>
</table>

**Week #7: Chapter 20**
Evaluate the effects of inductive reactance and how it opposes alternating current and how it alters the phase relationship between voltage and current in AC circuits

| Read: Grob Chapter 20 | Before the start of Lecture |
| Lab: Labs 20-1 Grob experiment book. | End of week #6 lab session |
| Skills Validation 5&6 | Written Test: | End of class week #6 |

**Week #8: Chapter 21**
Evaluate the effects inductive circuits

| Read: Grob chapter 21 | Before the start of Lecture |
| Lab: Lab 21-1 Grob experiment book | End of week #8 lab session |

**Week #9 Chapter 22**
Analyze RC and L/R time constants to determine the effects of changing values of R, L, C and time

| Read: Grob chapter 22 | Before the start of Lecture |
| Lab: Lab 22-1 Grob experiment book | End of week #8 lab session |
| Written Test: | | End of class week #9 |

**Week #10 Chapter 23**
Analyze Series AC circuits containing Xc, XL and R at the same time, noting how opposite reactance’s cancel

| Read: Grob chapter 23 | Before the start of Lecture |
| Lab: Lab 23-1 Grob experiment book | End of week #10 lab session |

**Week #11 Chapter 25**
Analyze resonant circuits and how they are used in communication devices to select a desired frequency

| Read: Grob chapter #25 | Before the start of Lecture |
| Lab: Lab 25-1 and 25-2 Grob experiment book | End of week #11 lab session |
| Written Test: | | End of class week #11 |

**Week #12 Chapter 27**
Determine the proper diode and transformer for rectifications circuits

<p>| Read: Grob chapter 27 | Before the start of Lecture |
| Lab: Lab 27-1 Grob experiment book | End of week #12 lab session |
| Written Test: | | End of class week #12 |</p>
<table>
<thead>
<tr>
<th>End-Of-Course Learning Outcomes</th>
<th>Activities/Assignments</th>
<th>Due Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read: Grob chapter #27</td>
<td>Before the start of the Lecture</td>
<td></td>
</tr>
<tr>
<td>Lab: Lab 27-1 &amp; 27-2 Grob experiment book</td>
<td>End of week #12 lab session</td>
<td></td>
</tr>
<tr>
<td>Skills Validation 13</td>
<td>Written Test: Covering diodes and diode applications</td>
<td>End of class week #12</td>
</tr>
</tbody>
</table>

Week #13 Chapter 26
Recognize the basic design characteristics of common filters used in modern electronic equipment; calculate the component values for these filters and measure their performance in decibels or other useable standards

| Read: Grob chapter #26          | Before the start of the Lecture |
| Lab: Lab 26- and 26-2 Grob experiment book | End of class week #13 |

Week #14 Chapter 27
Determine the proper diode and transformer for rectifications circuits

| Read: Grob chapter #27          | |
| Lab: Lab 27-3 & 27-4 Grob experiment book | End of class week #14 |

Week #15
Finals Week

| Skills Validation | Lab: Lab Final |
| Skills validation | Written Test: Comprehensive written final over all material covered in semester. | End of class week #15 |
### Education

<table>
<thead>
<tr>
<th>Name of Institution</th>
<th>Degree Earned</th>
<th>Date Earned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco College</td>
<td>Associates in Business Administration</td>
<td>September 1997</td>
</tr>
<tr>
<td>Texas State Technical College</td>
<td>A.A.S. in Wind Energy and Turbine Technology</td>
<td>August 2010</td>
</tr>
<tr>
<td>Texas State Technical College</td>
<td>Certificate in Energy Management</td>
<td>August 2012</td>
</tr>
</tbody>
</table>

### Certifications

<table>
<thead>
<tr>
<th>Name of Certification</th>
<th>Date Expires</th>
<th>Date Earned</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENSA Safe Access and Rescue</td>
<td>December 2010</td>
<td>Date Earned</td>
</tr>
<tr>
<td>Completion of CPR and First Aid</td>
<td>July 2013</td>
<td>Date Earned</td>
</tr>
<tr>
<td>OSHA General Industry Safety and Health 10hr</td>
<td>March 2010</td>
<td>Date Earned</td>
</tr>
<tr>
<td>Hytorc Operator/Safety Certification</td>
<td>July 2011</td>
<td>Date Earned</td>
</tr>
<tr>
<td>Solar Panel Installation</td>
<td>September 2013</td>
<td></td>
</tr>
<tr>
<td>Level I Thermography</td>
<td>December 2014</td>
<td>Date Earned</td>
</tr>
</tbody>
</table>

### Industry, Teaching or Training, and Other

(Examples: publications and memberships)

### Experience Relevant To Course

<table>
<thead>
<tr>
<th>Description of Experience Related To Course</th>
<th>Date Ended</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 years field experience in Wind Industry performing maintenance and warehousing</td>
<td>2005-2006</td>
</tr>
<tr>
<td>5 years experience performing electronics repair of video games, pinball, jukeboxes, redemption games</td>
<td>2003-2008</td>
</tr>
</tbody>
</table>

Teaching at Texas State Technical College

- Hydraulics
- Principles Of Electricity
- AC/DC Circuits
- Industrial Automation
- Downhole Tool
STUDENT ACKNOWLEDGEMENT:

This is to acknowledge that I have received a copy of the syllabus for the course CETT 1305 AC Circuits. I understand that it is my responsibility to read and understand the syllabus and to abide by the guidelines presented therein.

__________________________________  ________________________________
Student Printed Name    Signature

____________________
Date

Acknowledgement of Lab Safety Policy

Printed name:_____________________________  Date:________________

Signed name: _______________________________