COURSE TITLE: DC/AC II  COURSE NO: 605-114  CREDITS: 3 (Lec:2, Lab:2)

COURSE DESCRIPTION: The study of the voltage, current, resistance, and power in various circuits. Analyze network theorems as they apply to dc circuits. Explore the use of basic test equipment such as ohmmeter, amp meter, and Voltmeter. Introduction to ac waveforms, impedance, inductance and capacitance.


LABORATORY: Laboratory Packets, Gateway Technical College, 2004

PROJECT: Each student will hand in a course notebook at the end of the 15th week. See detailed information in Appendix A

REFERENCE: Hardware Data Manuals and Handouts

SECTION: 605-113

STARTING DATE: August 25, 2004

MEETING TIME: M,T,W,Th,F  8:00am - 1:00pm or M,T,W,Th  5:00pm - 10:00pm

LOCATION: T415

ENDING DATE: December 21, 2004

ASSIGNMENT & TEST: See the Course Plan in Appendix B

INSTRUCTORS: Patrick E. Hoppe 262.619.6462 hoppep@gtc.edu
Matthew Treu 262.619.6808 treum@gtc.edu
Randy Reusser 262.619.6898 reusserr@gtc.edu

PHONE EMAIL

OFFICE: ROOM: T414, FAX: 262.7169

OFFICE HOURS: Will be posted outside the office door at the start of class. If our office hours do not fit into your schedule, please contact us and we will find a mutually convenient time to meet.
If you have any special education needs or concerns, please contact your class-room instructor or Special Needs Instructor on campus (Linda Mahoney, or Peggy Jude @ 262-619-6228).

This course is offered in a modified self-paced format. There is a mandatory lecture each week. The day(s) & time(s) of the lecture(s) are picked on the first day of class. If more than one lecture is required to meet the needs of the students, then the student will choose which lecture they wish to attend. The student may attend more than one lecture per week, if they so chose. The Labvolt and lab experiments are to be completed during the open lab session. It is the responsibility of the student to schedule their time accordingly. The course must be finished by the end of the semester.

The report must be entered in to the Engineering Log book and follow the format in Appendix D. The report is to be shown to the instructor prior to starting the next laboratory assignment (unless otherwise noted by the instructor).

All assignments, laboratory reports, quizzes, tests must show all work leading to the answer(s). They are graded from 0 to 100 points each.

Each student must turn in his or her own work.

LabVolt Unit exams can only be taken up to three (3) times, the highest score will be used. If the exam is taken more than three times, the lowest score will be used.

<table>
<thead>
<tr>
<th>Point Value</th>
<th>EXAMS .........................35%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LABVOLT EXAMS ...........20%</td>
</tr>
<tr>
<td></td>
<td>LABS ..........................25%</td>
</tr>
<tr>
<td></td>
<td>Class Participation ...........10%</td>
</tr>
<tr>
<td></td>
<td>COURSE-BOOK .................10%</td>
</tr>
</tbody>
</table>

| Letter Grade | A 93% to 100% |
|             | A- 91% to 92% |
|             | B+ 89% to 90% |
|             | B 85% to 88% |
|             | B- 83% to 84% |
|             | C+ 81% to 82% |
|             | C 77% to 80% |
|             | C- 75% to 76% |
|             | D+ 73% to 74% |
|             | D 70% to 72% |
|             | D- 68% to 69% |
|             | F below 68%   |

- A Texas Instruments Engineering calculator (TI-86) or equivalent is required.
- A Scientific Notebook, available in the bookstore is required.
BROAD COMPETENCY

1. Follow national, state, and local industry established safety procedures.
2. Use established symbols, standards, conventions, and terminology.
3. Explain basic atomic theory as it applies to electronics.
4. Explain the elements and properties of a basic electrical circuit.
5. Describe DC voltage and the characteristics of DC voltage and current sources.
6. Describe electrical resistance, resistor types, and resister characteristics.
7. Measure electrical quantities.
8. Analyze voltage, current, resistance, and power relationships using Ohm’s and Watt’s Laws.
10. Analyze combination series and parallel circuits.
11. Explain the principles of magnetism and electromagnetism.
12. Analyze capacitance and capacitors in DC circuits.
13. Analyze inductance and inductors in DC circuits.
14. Describe AC voltage and the characteristics of AC voltage sources.
15. Describe types of transformers and the principles of their operation.
16. Analyze AC circuits containing reactive components.

CORE ABILITIES

Gateway believes students need both technical knowledge and skills and core abilities in order to succeed in a career and in life. The following nine core abilities are the general attitudes and skills promoted and assessed in all Gateway programs; those followed by an asterisk are promoted and assessed in this course.

1. Act responsibly *
2. Communicate clearly and effectively *
3. Demonstrate essential computer skills *
4. Demonstrate essential mathematical skills *
5. Develop job-seeking skills *
6. Respect self and others as members of a diverse society *
7. Think critically and creatively *
8. Work cooperatively *
9. Value learning *
Appendix A - Course-Book

The course-book will contain ALL handouts, class notes, quizzes, tests, and lab reports. The information will be divided into appropriate chapters of your book. Upon completion of this class, you will have a complete guide from which you may study from for future courses.

The course-book will contain a cover sheet with the following information:
- Course Name
- Course Number
- Your Name
- Date

The course-book will contain a Table of Contents with the following headings:
- Class Notes
- Quizzes
- Tests
- Lab Data
- Class Handouts

The course-book will be graded on its completeness and organization. Remember, you are creating this book for use as a reference for other classes, so you will benefit far beyond just the grade you receive for it. A three ring binder is recommended, 2" - 3" variety. Please put your name & course name on the spline of the binder.

Learning Objects

Learning Objects are included in the assignment schedule. It is your responsibility to complete them. They are not graded, nor does the instructor know if you viewed them. However, successful completion of the Learning Objects will most certainly improve your exam scores and more importantly, your overall understanding of the material. The Learning Objects were developed solely to aid you in your understanding of the material, please take advantage of them.

Learning Object Web Site:

http://cws.gateway.tec.wi.us/programs/objects
## Appendix B - Course Plan

<table>
<thead>
<tr>
<th>Unit</th>
<th>TOPIC</th>
</tr>
</thead>
</table>
| 1.   | **Review**  
  - Basic Electrical Quantities  
  - Ohm’s Law  
  - Power Law  
  - Series, Parallel, Series-Parallel circuit Analysis  
  - Kirchhoff’s Voltage Law  
  - Kirchhoff’s Current Law  
  - Magnetism  
| 2.   | **Circuit Theorems**  
  - Superposition Theorem  
  - Thevenin’s Theorem  
  - Norton’s Theorem  
| 3.   | **AC voltage**  
  - Radians of angular measure  
  - Period & Frequency  
  - Phase Relationships  
  - Current & Voltage characteristics  
| 4.   | **Inductance and Inductors**  
  - L/R time constant  
  - Increasing and Decreasing Current formulas  
  - Graphical representation of Current in the L/R DC circuit  
  - Inductive Reactance and its relationship to Frequency  
  - Volt-Amp- Reactive (VAR) Energy stored in the electrostatic field  
  - Testing the Inductor  
  - Uses of the Inductor  
|  | **Capacitance and Capacitors**  
  - RC time constant  
  - Charging and Discharging formulas  
  - Graphical representation of Charging and Discharging  
  - Capacitive Reactance and its relationship to Frequency  
  - Volt-Amp-Reactive (VAR) Energy stored in the electrostatic field  
  - Testing the Capacitor  
  - Uses of the Capacitor  
| 5.   | **Transformers**  
  - Mutual Inductance  
  - Turns, Current, and Impedance Ratio’s  
  - Step Up & Step Down Transformers  
  - Transformer Loading, Reflected Loads and Impedance Matching  
  - Isolation Transformers  
| 6.   | **RC Circuits**  

- Series RC circuit analysis
  1. Calculating circuit resistance, reactance, impedance and phase angle
  2. Calculating line (total) current and individual component voltage drops
  3. Calculating individual component powers
  4. Calculating overall circuit VAR’s, Watt’s and VA
- Parallel RC circuit analysis
  1. Calculating individual branch current
  2. Calculating line (total) current and total circuit impedance
  3. Calculating branch phase angle and circuit phase angle
  4. Calculating individual component powers
  5. Calculating overall circuit VAR’s, Watt’s and VA

7. RL Circuits
   - Series RL circuit analysis
     1. Calculating circuit resistance, reactance, impedance and phase angle
     2. Calculating line (total) current and individual component voltage drops
     3. Calculating individual component powers
     4. Calculating overall circuit VAR’s, Watt’s and VA
   - Parallel RL circuit analysis
     1. Calculating individual branch current
     2. Calculating line (total) current and total circuit impedance
     3. Calculating branch phase angle and circuit phase angle
     4. Calculating individual component powers
     5. Calculating overall circuit VAR’s, Watt’s and VA

8. RLC Circuits and Resonance
   - Analysis of Series RLC circuit
     1. At resonance
     2. Above & below resonance
   - Analysis of Parallel RLC circuit
     1. At resonance
     2. Above & below resonance
   - Bandwidth, Q, Half-power points

9. Advanced Theorems
   Mesh Analysis
   - DC only

   Nodal Analysis
   - DC Only

Final Exam
### Appendix C - Assignment Schedule

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Reading</th>
<th>LabVolt</th>
<th>Lab Projects</th>
<th>Electronic WorkBench</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Review</td>
<td>Ch. 2, 3, 4, 5, 6</td>
<td>Trainer fam. Safety Series/Parallel Circuits</td>
<td></td>
<td>Unit 1</td>
</tr>
<tr>
<td>2</td>
<td>Circuit Theorems</td>
<td>Ch 7, 8</td>
<td>Delta &amp; Wye Thevenin Circuits</td>
<td>Unit 1</td>
<td>Unit 3</td>
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<tr>
<td>3</td>
<td>Inductance &amp; Inductors</td>
<td>Ch 13,14</td>
<td>Inductance Inductive Reactance</td>
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<td>Unit 5</td>
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<tr>
<td>4</td>
<td>Capacitance &amp; Capacitors</td>
<td>Ch 17,18</td>
<td>Capacitance Capacitance Reactance</td>
<td>Unit 2</td>
<td>Unit 4</td>
</tr>
<tr>
<td>5</td>
<td>Transformers</td>
<td>Ch 16</td>
<td>Transformers</td>
<td>Unit 3</td>
<td>Unit 6</td>
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<tr>
<td>6</td>
<td>RC Circuits</td>
<td>Ch 19</td>
<td>RLC Circuits</td>
<td></td>
<td>Unit 7</td>
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<tr>
<td>7</td>
<td>RL Circuits</td>
<td>Ch 15</td>
<td>Series Resonance Parallel Resonance Power in AC Circuits</td>
<td>Unit 4</td>
<td>Unit 8</td>
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<tr>
<td>8</td>
<td>RLC Circuits &amp; Resonance</td>
<td>Ch 20, 21</td>
<td>Low and High Pass Filters Bandpass &amp; Band-stop Filters</td>
<td>Unit 5</td>
<td>Unit 9</td>
</tr>
<tr>
<td>9</td>
<td>Advanced Theorems</td>
<td></td>
<td>Mesh Analysis Nodal Analysis</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Homework:**
You have purchased a workbook as part of this course. Your success in this course is based on your ability to understand the material. You will not be successful if you don’t do the homework problems associated with each chapter. Your homework will not be graded directly, but time has shown than students that do all of the homework questions do very well on the exams.
Appendix D - Lab Report

Each lab report will be set up in the same fashion. It will contain the same sections, with only the information differing between reports. By creating a lab report in this manner, no important material will be overlooked nor will it be difficult to follow. Since you will be utilizing your labs as study material for future classes, organization and completeness will benefit you in the future.

**Top of Page**
- Lab Title
- Course Title
- Course Number
- Date Performed

**PURPOSE**
- A brief paragraph describing what you are investigating and what you might hope to find.

**PROCEDURE**
- How you set up your lab experiment, including:
  - Schematics
  - Drawings
  - Text

**DATA**
- Actual data collected during the lab, including:
  - Raw data
  - Graphs, plots
  - Measured values of components
  - List of components
  - List of test equipment

**RESULTS**
- What did you find out
- Was the data valid, if not, why not?
- Any difficulties experienced, what did you do to solve them