

**Course Number/Title:** AE 190 Basic Electronics

**Year:** Fall 2012

**Department:** Business & Technology

**Credit Hours:** 3

**Required Text:** None Required

**Days/Time:** Lecture Online

**Instructor:** Woodrow Boles

**Room #:** None

**Office Hours:** 8:00 am to 8:00 pm Monday-Friday

**Phone:** 870-740-9620 Cell

**Course Placement:** Freshman/Sophomore

**Pre-requisite:** None Required

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**Rationale:** With growing concerns about the future and security of the world's energy supply, renewable resources such as wind power are becoming increasingly important. Wind technology is a rapidly growing sector of the energy market. To work in Wind Energy you will need to understand how basic electronics work.

**Course Description:** This is a beginner course that covers the basics of electricity, safety, components, parts, schematics, basic circuits, multi-meters, and microcontrollers. These subjects are covered in a basic manor and you need to use extreme caution when working with electricity.

**Course Outline:**

1. Chapter 1: Starting with Electronics
2. Chapter 2: Keeping Things Safe
3. Chapter 3: Common Electronic Components
4. Chapter 4: Parts
5. Chapter 5: Schematics
6. Chapter 6: Basic Circuits
7. Chapter 7: Multimeters
8. Chapter 8: Microcontrollers

**Course Learning Objectives Assessed:**

Colby Community College (CCC) uses the North American Board of Certified Energy Practitioners (NABCEP) to help guide the college in learning outcomes. These outcomes are created for those individuals wanting to attain knowledge and application of solar photovoltaic system operations, CCC's technical track of courses is the perfect curriculum for students wanting to take the NABCEP PV Entry Level Exam. Below are the ten objectives contained in the North American Board of Certified Energy Practitioners' (NABCEP's) Entry Level Program:

1. PV Markets and Applications
2. Safety Basics

3. Electricity Basics
4. Solar Energy Fundamentals
5. PV Module Fundamentals
6. System Components
7. PV System Sizing Principles
8. PV System Electrical Design
9. PV System Mechanical Design
10. Performance Analysis, Maintenance and Troubleshooting

CCC Student Learning Outcomes (NABCEP) to be measured in This Course

1. Electrical Basics (3.1) Define the meaning of basic electrical parameters including electrical charge, current, voltage, power and resistance, and relate these parameters to their hydraulic analogies (volume, flow, pressure, hydraulic power and friction)
2. Electrical Basics (3.2) Explain the difference between electrical power (rate of work performed) and energy (total work performed).
3. Electrical Basics (3.4) Identify basic electrical test equipment and its purpose, including voltmeters, ammeters, ohmmeters and watt-hour meters.

### **Course Competencies**

The overall objective of this course is to assist students in obtaining the North American Board of Certified Energy Practitioners (NABCEP) PV installer Certification. This course gives an introduction into electronics and how to be safe with electricity and electronics.

### **Chapter 1**

- Understanding the role of electrons, conductors, and voltage
- Looking at how electricity is generated
- Exploring some electronic components
- Connecting components together in circuits
- Breaking it all down into units
- Understanding Ohm's Law

### **Chapter 2**

- Using common sense when working with electronic components
- Avoiding electrocution
- Keeping watch over static
- Working with AC current
- Wearing the right clothes for safety

### **Chapter 3**

- Get the lowdown on resistors
- Quickly changing resistance with potentiometers
- Discovering how to pick the best capacitor for your circuit
- Decoding common markings on resistors and capacitors
- Delving into diodes, including the kind that light up
- The truth about transistors
- Understanding integrated circuits

## **Chapter 4**

- Picking the perfect type of wire
- Powering up with batteries and solar cells
- Flipping switches
- Controlling output with logic gates
- Tuning signals with inductors and crystals
- Making sense of things with sensors
- Exploring how DC motors work

## **Chapter 5**

- Understanding the role of schematics
- Getting to know the most common symbols
- Using component polarity
- Diving into some specialized components
- Having fun with schematics from around the world

## **Chapter 6**

- Seeing a circuit for what it is
- Looking at a basic circuit
- Arranging circuits in series and parallel
- Lowering your voltage with a voltage divider circuit
- Taking the measure of current
- Teaming up resistors and capacitors
- Working with transistors
- Amplifying even better with an op amp
- Keeping things simple with ICs

## **Chapter 7**

- Understanding the basics of multimeters
- Keeping yourself (and your multimeter) safe
- Using a multimeter to measure all kinds of things
- Going digital or analog
- Setting up your multimeter
- Making five basic tests to get started
- Testing resistors, diodes, and other components

## **Chapter 8**

- Exploring how microcontrollers work
- Getting into a microcontroller's guts

### **Method of Instruction:**

Lectures, including assigned reading, class discussions either in the physical classroom or online format, individual assignments. Student questions are an important part of the learning process. Students will be expected to participate in open class discussions and assignments. Be prepared for questions on given topics.

### **Method of Evaluation:**

The student's evaluation whether in the classroom or online, will be based upon discussion and review questions, webliography, a research paper, quizzes, and a final exam. The following will be how the course will be weighted:

Thread Discussions	(80 Points)	11.8%
Webliography	(70 Points)	10.3%
Quizzes	(150 Points)	22%
Research Paper	(80 Points)	11.8%
Mid-Term	(100 Points)	14.7%
<u>Final Exam</u>	<u>(200 Points)</u>	<u>29.4%</u>
<b>Total</b>	<b>(680 Points)</b>	<b>100%</b>

### **Grading Scale**

Letter grades are assigned as follows:

90-100	A
80-89	B
70-79	C
60-69	D
Under 60	F

### **Course Requirements:**

Understanding comes from interacting and you cannot interact if you do not participate in class. Be sure to take notes on what you see in assigned reading, or during lectures. Important objectives are presented in each class meeting or in each online unit. Communicating your thoughts in the physical classroom or within the online threaded discussion is an important component of learning and participation is an important part of the course.

### **Assignment Policy:**

All assignments must be completed and handed in at the designated times assigned by the instructor. No late work will be accepted. (Usually, assignments will be requested at the beginning of class; any attempt to turn in later will be considered late and not accepted.)

### **Test Policy:**

Instructor reserves the right to schedule proctored exams.

### **Attendance Policy:**

For the physical classroom, attendance is required and roll will be taken daily. Class interaction is important, and material covered in lecture may appear on the test. For online instruction of this course, your attendance is noted by your interaction on the discussion thread and through online assessments.

### **Assessment**

Colby Community College assesses student learning at several levels: general education, program, and course. The goal of these assessment activities is to improve student learning. As a student in this course, you will participate in various assessment activities. An example of your work, a paper, some test questions, a presentation, or other work may be selected for assessment. This process will not affect your grade, will not require you do additional work and your evaluation will be confidentially handled. Results of these activities will be used to improve teaching and learning at Colby Community College.

**Syllabus Information Disclaimer** I reserve the right to change any information contained in this document, when necessary, with adequate notice given to the student. Notice shall be given in the classroom during class (or online). No other notice is required. It is the students' responsibility to stay current with any changes, modifications, adjustments or amendments that are made to this document."

**Accommodations for Students with Disabilities** According to the Americans with Disabilities Act, it is the responsibility of each student with a disability to notify the college of his/her disability and to request accommodation. If a member of the class has a documented learning disability or a physical disability and needs special accommodations, he/she should contact Student Support Services, which is located in the Student Union.”

**Equipment:**

None of the equipment is required, but to help understand the assigned reading it helps to have some of the equipment. Parts such as a breadboard, wires, resistors, capacitors, transistors, batteries, LEDs, ICs, and other electrical components will help you learn what they really do. A multimeter would be extremely useful for Chapter 7 and when working with a breadboard. Please read the manual and the Chapter 2 & 7 for safety tips.

**Bibliography:**

NCCER Contren Learning Series (2011). Upper Saddle River, NewJersey Pearson Education, Inc.

**Recommended Resources:**

1. Code of Federal Regulations, Chapter 29 Part 1926 – Safety and Health Regulations for Construction, Occupational Safety and Health Administration: [www.osha.gov](http://www.osha.gov)
2. 2008 National Electrical Code ®, NFPA 70 or 2008 National Electrical Code® Handbook, National Fire Protection Association®: [www.nfpa.org](http://www.nfpa.org)
3. Study Guide for Photovoltaic System Installers, North American Board of Certified Energy Practitioners, Version 4.2, April 2009: [www.nabcep.org](http://www.nabcep.org)

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