

## Digital Electronics/Microcontrollers

Spring, 2006

---

**Basic Course Description:** ET 12 is a one-semester course in digital (computer) electronics – covering the “building blocks” of all computer devices: digital logic circuits. In addition, microcontrollers and digital communications/ interfacing will also be taught. An **algebra-level** math background as well as a strong reading ability will be very helpful. **Basic computer skills are also essential for this course!**

Digital electronics is the foundation of most of the new electrical technologies. This course is meant for those who are seriously considering a career in electronics, or those who are pursuing a career in the computer sciences, automotive electronics, HVAC systems, industrial electronics, voice/data/ telecommunications, telemetry/control, and instrumentation.

**Instructor:** Mr. Caras Office Phone: 395-4393 (during class hours)  
E-Mail: [scaras@bakersfieldcollege.edu](mailto:scaras@bakersfieldcollege.edu)  
Website: <http://www2.bakersfieldcollege.edu/scaras>

**Class Times:** T, Th 6:30-9:38pm Room IT 6  
Students can also make up labs when the instructor is teaching his other classes by simply arranging it with the instructor.

**Textbook:** None Required – Students will obtain all reading assignments from the Course Materials Pack they purchase from Office Max.

**Lab Manual:** None Required. The instructor will furnish all lab booklets/materials.

**Materials Needed:** *Scientific Calculator, Non-programmable.* (If your calculator has computer number conversion abilities, it will not be allowed during certain tests and the final exam.)  
*Circuit Breadboard* (DIP board), *Diagonal Cutters*, *Wire Strippers* (for small gage wire), *long-nosed pliers*.

**Please purchase alligator clips: Radio Shack# 270-375**

**Note:** All test equipment will be available for use in the Electronics lab.

**Instructor Office Hours:** Students are encouraged to come in during regularly scheduled office hours when they need assistance with the course assignments and content. ***Mr. Caras' office hours are posted outside his office door***, and usually begin ½ hour before each class time, and ½ hour after each class time. (In other words, you can come in early before class, stay after class, or come in before another course's class time.)

## Student Success and Student Responsibilities

**You are enrolled in a college course that is meant to prepare you for the workforce.** Our goal is to provide you with organized lecture, lab activities, and resources that will help you successfully learn the material we present. In return, **we expect you to take responsibility for your success in this course.** The class is certainly challenging, but we feel that you will find it interesting, fun, rewarding, and worthwhile – as long as you take your responsibility as a student seriously.

Make sure these things are true for you as a student:

1. I am adequately prepared for the academic needs of this course:
  - I have taken a recent math course of **at least pre-algebra level**, or have the ability to perform this level of math without help.
  - I have the ability to **read and understand technical-level reading materials**, beyond a basic understanding of English and a basic reading level.
  - I have the ability to **write clearly and take adequate notes in class**.
2. **If I have academic difficulties in one or more of the areas listed above, I am willing to do what is needed to overcome these difficulties, such as:**
  - Seek tutoring assistance from the Learning Center.
  - Take needed Academic Development courses in: study skills, reading, writing, and note taking.
  - Take advantage of math tutorial computer programs in the Learning Center or Math Lab.
  - Ask the professor for suggestions on improving their academic abilities.
3. I can and will set aside uninterrupted study time of at least three hours per week or more as needed if I find the material extra-challenging.
4. I will ask questions in class for clarification if I don't understand.
5. I will strongly consider organizing or participating in a study group outside of class.
6. I will ask questions of the professor during office hours if extra help is needed.
7. I will keep up with reading assignments, worksheets, and written materials each week – not wait until just before they are due to complete them.
8. I will view studying for each test as an ongoing process – not something that is done a day or two before the test. I will try to read assignments before they are covered in classroom lecture.
9. I will actively participate in lab work, and share responsibilities equally with my lab partner.
10. I will take notes during lecture, and especially note anything that I have not already studied or that I don't fully understand.
11. I am able to focus on the class and meet their responsibilities as a student without being overly-challenged by the needs of school, work, and family.

12. If I have outside issues and challenges that interfere with my learning, I will do what is necessary to minimize their impact on my learning. This can include:
- Develop time management skills for outside issues.
  - Develop a support network for outside issues.
  - Assess honestly the amount of time I devote to class.
  - Discuss with the professor the interfering issues if appropriate.

### Student Responsibilities

As a student, you are being prepared for a career, and it makes perfect sense that we expect the same things from you that an employer would. Please read these responsibilities carefully. We want you to remain in this course for the entire semester and experience success. Not meeting your responsibilities will put your enrollment and success at risk!

Make sure you are willing to accept these responsibilities a student:

1. I will **demonstrate a great work ethic** while I am in this course. This includes:
  - **Being here and ready to work when the class begins**, because I understand that continued lateness – other than unavoidable job-related issues – could mean I will be dropped from the course. I also understand that my instructor is not responsible to warning me about absences before I am dropped. **For attendance enforcement purposes, three tardies equals 1 absence.**
  - **Keeping absences to a minimum**, because I understand that more than two weeks of absences will result in a drop from a class or the assignment of a failing grade regardless of my actual scores.
  - **Actively participating and focusing on the tasks at hand**. This means avoiding cell-phone interruptions (except for work or family emergencies), sleeping or inattention in class, or using distracting items such as music players and laptops during lecture.
2. I will **purchase the needed items** such as the textbook (if assigned), course materials packs, solderless breadboard, basic hand tools, and alligator clips, **and come to class prepared with these items.**
3. I will **do my own work**, including assignments and lab response sheets. I understand that turning in material that I have copied from someone else is plagiarism, and will result in a failing grade on that assignment, and continuing to do so will jeopardize my enrollment in this course.
4. I will **be in class on test days**, because I realize that there are no make-ups for missed tests. If I know I will be absent on a test day, I will make arrangements with my instructor prior to the absence.
5. I will **communicate with my instructor regarding work-related scheduling issues, absences for more than one class day in a row,**
6. I will **communicate with my instructor** if I feel that I am struggling in class, have issues that interfere with my continuing on in the class, or before I decide to drop the class because I am discouraged or worried about my grade.
7. I will **assume the responsibility of going on-line and dropping myself** from the course if I cannot continue in the class. I will not assume that I will be automatically dropped by the instructor if I simply stop showing up to class.
8. I will **complete a minimum of 85% of my lab assignments, in the presence of my instructor** during assigned or make-up lab time, because I understand that if this requirement is not met, I will not receive a grade higher than an “F” for the course.

9. I will **interact with other students in the course during lab time**, because I realize that all employees in this technical field must be able to work with others. I understand, however, that this includes staying focused on the activity at hand, and not merely socializing. I also understand that doing this makes it easier for me to be successful in lab.
10. I will **properly care for the equipment, materials, and workstations** that I use.

### **Students With Disabilities**

Bakersfield College will make reasonable accommodations and/or academic adjustments to ensure that students with disabilities have an equal opportunity to participate in the college's courses, programs and activities, including extracurricular activities. Students with disabilities who are requesting academic accommodations or auxiliary aids should contact Supportive Services at (661) 395-4334. Participation by students with disabilities in Supportive Services is voluntary. Any student choosing not to participate in the program may elect an alternate path for support services through the office of the Dean of Learning Support Services.

### **Estudiantes Incapacitados**

Bakersfield College proveerá servicio y/o arreglos académicos para asegurar que estudiantes incapacitados tengan oportunidades iguales para participar en las clases de esta escuela, incluyendo actividades extraescolares. Tales estudiantes que piden arreglos o aparatos auxiliares deben llamar a Supportive Services a 661-395-4434. Participación es voluntaria. Estudiantes que no desean participar en este programa pueden ponerse en contacto con la oficina del Decano de Aprendizaje/Servicios Auxiliares.

### **Important Dates**

Last day to drop the class without a "W" is: Friday, February 23<sup>rd</sup>.

Last day to drop the class with a "W" (and not an "F") is: Friday, March 24<sup>th</sup>.

**After this date, neither you nor your instructor can drop you from the class!**

### **Holidays**

Monday, January 16 – Martin Luther King Jr. Holiday – No Classes Held

Friday, February 17<sup>th</sup> – Lincoln's Day Holiday – No Classes Held

Monday, February 21<sup>st</sup> – Washington's Day Holiday – No Classes Held

Monday, April 10 through Friday, April 14 – Spring Break Holiday

### **Returned Work Policy:**

It is the policy of the instructor to not return graded lab materials until the end of the course. This is to discourage copying of lab work from other people in the class. Assignments that are turned in prior to the applicable test may not be returned until the test has been completed. All students must turn in their own copy of each assignment and lab sheet. Please do not put yourself in a bad situation by copying from another person's work, even if it is your partner.

**Bakersfield College Electronics Program**  
**Student Learning Outcomes and Core Course Competencies**

**Student Learning Outcome 1**

Students will demonstrate an understanding of course-specific electronic theory and applications in the following circuit types: analog, digital, industrial, and electronic communications.

**Student Learning Outcome 2**

Students will demonstrate the ability to properly use basic electronic test equipment for measurement and troubleshooting purposes.

**Student Learning Outcome 3**

Students will demonstrate the ability to read, interpret, create, and utilize schematic diagrams for circuit fabrication and troubleshooting purposes.

**Student Learning Outcome 4**

Students will demonstrate essential employment-seeking and workplace skills for a technical/customer-oriented work environment.

**ET 12 Student Learning Outcomes**

1. Correctly apply the common commands and use proper programming structure of the PBASIC programming language to solve assigned problems using the BASIC Stamp microcontroller module.
2. Correctly identify and explain the common applications of digital electronics and the following digital logic devices: logic gates, encoders and decoders, counters, and flip-flops.
3. Correctly explain the function of, and apply in simple interfacing activities, basic sensor devices, basic output devices and indicators, digital-analog and analog-digital converters, and motion devices such as stepper motors and servomotors.
4. Correctly perform circuit analysis and simple troubleshooting using the logic probe, oscilloscope, and digital trainer, and perform digital circuit fabrication using schematic diagrams within the assigned lab activities.

### **Course Grade Calculation**

A separate form will be provided for calculation of course grade, but the basic format is:

**An “A” Student in ET 12:**

- Has a total module (class pack) grade of “A” or “B”.
- Has passed 14 or more competencies and practical exams on the first attempt.
- Has a total lab work grade of “A”.
- Has a total employee skills grade of “A”.
- Has completed a minimum of 85% of the assigned labs.

**A “B” Student in ET 12:**

- Has a total module (class pack) grade of “A” or “B”.
- Has passed 13 or more competencies and practical exams on the first attempt.
- Has a total lab work grade of “A” or “B”
- Has a total employee skills grade of “A” or “B”
- Has completed a minimum of 85% of the assigned labs.

**A “C” Student in ET 12:**

- Has a total module (class pack) grade of “A,” “B,” or “C”.
- Has passed 11 or more competencies and practical exams on the first attempt.
- Has a total lab work grade of “A” or “B”.
- Has a total employee skills grade of “A” or “B”
- Has completed a minimum of 85% of the assigned labs.

**A “D” Student in ET 12:**

- Has a total module (class pack) grade of “A,” “B,” or “C”.
- Has passed 9 or more competencies and practical exams on the first attempt.
- Has a total lab work grade of “A” or “B”.
- Has a total employee skills grade of “A” or “B”
- Has completed a minimum of 85% of the assigned labs.

**An “F” Student in ET 12 has met one or more of the following conditions:**

- Has not met the minimum conditions of a “D” student listed above.
- Has passed less than 9 competencies and practical exams on the first attempt.
- Has not completed a minimum of 85% of the assigned labs.

There are 12 knowledge “competency tests” and 5 “practical exams” that you will take in this course.

**The “Employee Skills” grade is calculated as follows:**

- A 2 or less unexcused absences, 3 or less unexcused tardies, plus full participation in class on a regular basis.
- B 3 or 4 unexcused absences, plus less than 5 unexcused tardies, plus full participation in class on a regular basis.
- F More than 4 unexcused absences and/or 5 or more unexcused tardies. Also an “F” grade in this category could be assigned if expectations of class participation are not met.

**Please Note:** The instructor reserves the right to change the assignments to fit the needs of the class.

Week #	Week Of	Topic	Assignment Pack	Lab Topic
1	Jan 16	Course Orientation Basic Electronics Review Lab Equipment Use and Procedures	Pack 1	No Lab Assignments This Week
2	Jan 23	Digital Systems Computer Number Systems	Pack 2	DE1 DE1a
3	Jan 30	Introduction to the BASIC Stamp Programming Basics <b>Tests 1 and 2, Pack 2 Due Thursday</b>	Pack 3	DE2
4	Feb 6	PBASIC Programming & Commands Stamp Memory and Registers	Pack 3	DE4 DE5
5	Feb 13	Data Input Methods <b>Tests 3 and 4, Pack 3 Due Thursday</b>	Pack 4	DE6
6	Feb 20	Sensors Used in Digital Electronics Data Output Methods	Pack 4	DE8 (EC) DE9
7	Feb 27	Microprocessor Basics PLC Basics <b>Test 5, Pack 4 Due Thursday</b>	Pack 5	DE10 (EC)
8	Mar 6	Logic Gates and Boolean Algebra	Pack 6	DE11
9	Mar 13	Flip-Flops and Latches <b>Test 6, Pack 5 Due Thursday</b>	Pack 6	DE12
10	Mar 20	Counters Shift Registers	Pack 6	DE13
11	Mar 27	Interfacing DC Motors, Servo Motors, Stepper Motors	Pack 7	DE17
12	Apr 3	<b>Tests 7, 8, 9, and 10, Pack 6 Due Thursday</b>	Pack 7	DE18 DE15 (EC)
	Apr 10	<b>Spring Break – No Classes Held</b>		
13	Apr 17	Digital Signal Processing <b>Test 11, Pack 7 Due Thursday</b>	Pack 8	DE19
14	Apr 24	Digital Signal Processing, Continued	Pack 8	DE20 DE21
15	May 1	Final Exam Review <b>Test 12, Pack 8 Due Thursday</b>		
16	May 8	Final Exam Week: Final Exam Thursday, May 11 <sup>th</sup> – 6:30-8:20pm (No Class on Tuesday, May 9 <sup>th</sup> )		

# Success Checklist

Successful students in this course will meet these expectations:

- Treat their time in the course as if they were at work, which includes making sure that outside challenges do not interfere with their work in class.
- Come to class prepared with the needed materials, tools, supplies, and completed class work.
- Pass a minimum of 13 competency tests and practical exams during the semester.
- Have less than 4 unexcused absences and less than 5 unexcused tardies during the semester.
- Complete assigned labs by their deadlines and come in during outside hours to make up lab work if they are behind.
- Continually study reading materials and handouts, preferably before the lecture on those topics.
- Actively participate in lab work, ask questions when they don't understand, and solve problems independently as much as possible.