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│                      ECHT 191ab,   3 Units                            │
│      INTRODUCTION  TO  MICROPROCESSORS  AND  INTERFACING               │
│                      January 21  -  May 15                            │
│      No Class on March 18 and March 20 due to Spring Break            │
│                                                                       │
│          Division of Industry & Technology  310-660-3600              │
│                                                                       │
│     6:30 - 7:30 PM  Tu       Lecture ..... Bob Diaz...........TA-105   │
│     6:30 - 7:35 PM       Th  Lecture ..... Bob Diaz..........TA-105    │
│     7:40 - 9:50 PM  Tu, Th  Lab ........ Bob Diaz...........TA-105     │
│     Section  7479                          rdiaz@elcamino.edu          │
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El Camino College is committed equal employment and educational opportunities for all individuals, regardless of race, color, ancestry, religion, gender, national origin, martial status, sexual orientation, handicap, age, and Vietnam-era status.

Required Text:

> **Introduction To The PIC Micro, By Bob Diaz, ECC Bookstore**
>
> <u>**Good news:**</u> I have written a textbook for this course. <u>**Bad news:**</u> The book has only been partly updated, but is good enough for us to use. <u>**Good news:**</u> The price is reasonable: **UNDER $20**. (I receive $0 for every book sold.)

Course Discription:

> This course is an introduction to industrial microprocessors and microcontrollers as they relate to industrial and consumer equipment. Included are the fundamentals of assembly language, use of software to simulate hardware, digital and analog interfacing, data storage, and troubleshooting.

Additional Comments:

> Electronics 191ab introduces the student to the microprocessor. About 70% of this class looks at the hardware and about 30% covers software. We use the **16F690** PIC and the **16F505** PIC microprocessors (micro-controllers) to learn how hardware and software work together. In order to successfully pass this class, the student should have an electronics background. ECHT 11 or ECHT 130 is strongly recommended, but not required. Also, having any computer experience, like BASIC programming or working with a PC will be helpful.
>
> The "ab" in the number "ECHT-191ab" indicates that a student is allowed to take this course a second time. However, this is the last time it will be run as an "ab" class. Budget cuts at the state level now prevent us from offering a class a second time to a student who has passed the class.

Cource Prerequisite: ECHT-11, ECHT-130, **or** Electronics Background

Course Objectives:
1. Analyze how both hardware and software work together in a system.

2. Solve the basics of troubleshooting a microprocessor and microcontroller system.

3. Examine how data flows to and from the microprocessor and microcontroller.

4. Examine how timing and interrupts operate.

5. Evaluate the differences in serial and parallel interfaces and the timing requirements.

6. Set up an oscilloscope to measure the clock and output waveforms of a microprocessor and microcontroller.

7. Construct the steps required to solve a timing problem and convert the steps into a logical program.

8. Compare and contrast the architecture used in microprocessors and microcontrollers.

Student Learning Outcomes:
Students will be able to develop software and build hardware for basic microprocessor/microcontroller functions.

Assessment Activites:
Four things determine your grade: Two Tests, the Final, and Labs/Attendance. The total for each item is converted into a percentage of the total grade as follows:

Test #1	25%	100% – 90%	=	A
Test #2	25%	89.9 – 80%	=	B
Test #3 (Final)	25%	79.9 – 70%	=	C
Labs (Total)	25%	69.9 – 60%	=	D
---------------------		below 60%	=	F
Total	100%			

REMEMBER: **Your attendance will have a major impact on your grade.**

Evaluation Criteria:
All tests will be True/False and Multiple Choice. You will be writing directly on the test.

For all tests, there is a set day for taking each one. If you are going to be out that DAY, please let me know **BEFORE** the test.

Grading Scale: Your final grade for this class is calculated as a percentage of possible points.

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100% - 90%  =  A
 89% - 80%  =  B
 79% - 70%  =  C
 69% - 60%  =  D
 59% -  0%  =  F
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Instructor: Bob Diaz, Instructor, El Camino College
rdiaz@elcamino.edu
I do not have an office or a phone on campus.
310-660-3593 x4209 voicemail only

El Camino College
CLASSROOM POLICIES

EL CAMINO COLLEGE MISSION STATEMENT

The mission of El Camino College is to meet the educational needs of our diverse community and ensure student success by offering quality comprehensive educational opportunities.

ATTENDANCE POLICY

1. Attendance at first class

Students who enroll in class but do not attend the first scheduled class meeting may be dropped from the roster. A student who registers for a class and never attends is still responsible for dropping the class.

2. Attendance without official enrollment

Students will not be permitted to attend classes in which they are not enrolled.

3. Attendance during semester

A student may be dropped from class when the number of hours absent exceeds the number of units assigned to the course. If your absences and tardiness exceed the unit value of the course, you can be dropped. This rule also applies to excessive absences due to illness or medical treatment.

CHILDREN IN CLASSROOMS

Children are not permitted in classrooms while class is in session. Attendance in class is limited to officially enrolled students and authorized visitors or guests. In addition, students must not allow children to be left unsupervised or unattended anywhere on campus.

CLASSROOM MISCONDUCT

1. Dishonesty, including but not limited to cheating, plagiarism or knowingly furnishing false information to the College.

2. Forgery, alteration, or misuse of college documents, records, or identification.
3. Violation of college policies or off -campus regulations, including but not limited to campus regulations concerning student organizations, the use of college facilities, or time, place, and manner of public expression.
4. Continued disruptive behavior, continued willful disobedience, profanity or vulgarity, or continued defiance of the authority of, or abuse of, college personnel or to anyone on campus.
5. Willful misconduct which results in injury or death to a student or college personnel.
6. Assault, battery, sex crimes including sexual assault or rape, or any threat of force or violence upon a student or college personnel.
7. Sexual harassment which includes unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature.
8. Obstruction or disruption of teaching, research, administration, disciplinary proceedings, or other authorized college activities including but not limited to its
9. community service functions or to authorized activities held off campus. Obstruction or disruption includes but is not limited to the use of skateboards, bicycles, radios, and roller skates.
10. Unauthorized entry to or use of college facilities, equipment or supplies.
11. Theft or deliberate damage to property of a college staff member, a student, or a visitor to the college including but not limited to the Library, Bookstore, and Food Service areas.
12. Defacing or damaging any college real or personal property.
13. Failure to comply with the directions of a member of the college certificated personnel, college management or supervisor personnel, or campus police acting within the scope of his or her duties.

DISCIPLINARY ACTION

Disciplinary action appropriate to the misconduct as defined above may be taken by an instructor the Dean of Student Services or his or her designee and the Board of Trustees.
Misconduct should be brought to the immediate attention of the Campus Police, or local police department/security force for courses taught off campus.

Removal by Instructor — In addition to an instructor's right to drop a student permanently from a class when the student is no longer participating i.e. lack of attendance in the course, an instructor may remove (suspend) a student from his or her class for the day of the incident and the next class meeting. During this period of removal, a conference should be held with the instructor and the student to attempt to resolve the situation that led to the student's removal and the student shall not be returned to the class from which he or she was removed without the concurrence of the instructor of the class.
1. If a student is suspended for one class meeting, no additional formal disciplinary procedures are necessary.
2. If a student is suspended from class for the day of the incident and the next class meeting, the instructor shall send a written report of the action to his or her dean who shall forward this information to the Dean of Student Services, the Provost. If the student removed by an instructor is a minor, the President's designee (Dean of Student Services) shall ask a

parent or guardian of the student to attend a parent conference regarding the removal as soon as possible. If the instructor or the parent or guardian so requests, a college administrator shall attend the conference.

3. The instructor may recommend to his or her dean that a student be suspended for longer than two class meetings. If the dean, instructor and student cannot resolve the problem, the suspension will be referred to the President or the President's designee.

4. During the period following the initial suspension from class for the day of the incident and the following class meeting, the student shall be allowed to return to the class until due process and the disciplinary procedures are completed unless the student is further suspended as a result of actions.

CHEATING OR PLAGIARISM POLICY

This policy applies to all forms of dishonesty, including but not limited to cheating, plagiarism or knowingly furnishing false information to the college.

CONSEQUENCES FOR CHEATING OR PLAGIARISM

Given alleged violation of the Standards of Conduct, any or all of the following actions may be imposed:

1. When there is evidence of cheating or plagiarism in classroom work, students may receive an F for that piece of work or may be suspended from all classes for that term and the following term if deemed appropriate.

2. The instructor may assign a failing grade to the examination or assignment in which the alleged cheating or plagiarism occurred. This action is based on information that the instructor had.

3. The instructor may dismiss the student from the class or activity for the present and/or following class session(s)

4. The instructor may recommend suspension or expulsion of the student from the college as stipulated in BP5138, Section IIB6 and 8. This recommendation must be in accordance with El Camino College's Due Process and Disciplinary Procedures.

5. The instructor will complete the Academic Dishonesty Report Form and submit it to the Academic Affairs Office.

EXAMPLES OF CHEATING OR PLAGIARISM

1. Representing the words, ideas or work of another as one's own in any academic exercise (plagiarism), including the use of commercial term paper companies;

2. Copying or allowing another student to copy from one's paper or answer sheet during an examination;

3. Allowing another individual to assume one's identity for the purpose of enhancing one's grade in any of the following: testing, field trips or attendance;

4. Falsifying or attempting to falsify attendance records and/or grade rosters;

5. Changing answers on a previously scored test, assignment or experiment with the intent to defraud;

6. Inventing data for the purpose of completing a laboratory experiment or case study analysis with the intent to defraud;

7. Giving and/or taking information during an examination by any means such as sign language, hand signals or secret codes;
8. Obtaining copies of notes, exams or exam questions by any means other than distribution from the instructor. (This includes copying and removing exam questions from the classroom for any purpose.);
9. Using study aids such as calculators, tape recorders or notes that have been specifically prohibited by the instructor.

STUDENTS WITH DISABILITIES

Students with disabilities who believe they may need accommodations in this class are encouraged to contact the Special Resource Center as soon as possible to better ensure such accommodations are implemented in a timely fashion. Also, please contact the instructor privately to discuss your specific needs.

ADDITIONAL ITEMS

TESTS:

Tests answers will be written directly on the test paper. Test questions will be True/False and Multiple Choice. Do NOT miss a test, because there will NOT be any "make-up" tests. If you think you will not be able to come on a night we have a test, please be sure to let me know BEFORE the day of the test. The sooner you tell me, the sooner we can plan on a different time for you to take the test.

In the last part of a test, you may be asked to write a short section of program code and or do a simple conversion/calculation. I may chose to have you do the programming directly on the computer into the PIC. **You will be given a handout of instructions and this list of instructions IS ALLOWED to be used with any test.**

LABS:

Labs are graded as follows:

When it comes to labs, I will be somewhat forgiving to those who are here and try to do the work. (Lab time ends at 9:50 PM; those who leave before that time and are not finished, are not trying.) On the other hand, if you have done your best (as in worked the <u>full</u> lab hours) and finished only part of the assignments, you will still receive credit.

The **Tuesday night lab is a "discovery lab"** where you will be given the code that solves the problem. Consider Tuesday as a night to see how to make it work. Tuesday night is just a simple sign-in sheet at the end of the lab. **Thursday night you'll be given a problem and using what you learned on Tuesday, solve the problem. Any notes and handouts are allowed for labs.**

Your lab grades can range from 0 to 5 points. Every Thursday lab must have a score sheet. I need to see you work before I sign off on the lab.

No more than 2 people may work together on any lab. We have 8 kits with 2 boards, so two teams will check out a kit and use one board. Your groups will be assigned a kit number that you'll check out each time.

One person should build the hardware and the other work on the software. Once the hardware and software are ready, trade places and double check the other person's work. In the next lab, I strongly suggest that you trade places and do the other job. Teams are welcome to share ideas about how to do the lab BUT, you may not share your code with the other teams. Giving code to other students will be considered a form of cheating. This puts into motion a chain of events that is very unpleasant for everyone. El Camino College takes any cheating very seriously.

I strongly suggest that you bring a Memory Stick to save your project on. Do NOT save any project to the hard drive on the computer. The software on the computer always cleans up the HD with every re-boot.

A new set of labs is assigned for every chapter. The assigned labs are due that week. In the event that several of the teams are having trouble with the labs for that week, I may need to drop next week's lab.

Near the end of the class we'll have a special project that you will be assigned. This will take 4 lab times to finish and at that point there will no longer be any "Discovery Labs".

DROPS:

Except for those who do not show up for the first class, I do not automatically drop anyone. For those who show up at the beginning, **I do NOT automatically drop you if you stop showing up for class**. As stated in the College Catalog and Schedule of Classes, it is the student's responsibility to drop a class. If for whatever reason you need to drop a class, please go to the Admission's Office and fill out (and turn in) the necessary forms.

CHEATING:

All cheating is put on a report to the Dean of IT, the Assistant Dean of IT, and to the Dean of Student Services. This puts into motion a chain of events that is very unpleasant for everyone. El Camino College takes any cheating very seriously.

> **Warning:** if you help another student cheat, you are as guilty as the student who cheated. Do not let yourself get trapped in this situation.

LECTURE & LAB:

We will be having both Lecture and Lab every day. The first part of the class will be lecture. (About an hour or so.) After lecture, you can take a short break and work on your lab work. We have about 2 hours for you to do the lab work.

HOMEWORK:

Reading the book will be your homework I strongly recommend you do read the chapter before the class. Also, corrections of typos and other errors are always welcome. IF something in the book does not make any sense, maybe I didn't say it correctly, please ask me...

USB Flash Memory Stick required; 512 MB or larger. The deep freeze software on the computer will erase anything you try and save on the hard drive. The USB Drive is the only way to keep your work. There are also additional documents that we use in class and the flash drive is how we save them.

If for whatever reason you don't have a flash drive, a floppy will work, BUT saving/reading to/from a floppy is very slow.

Class Number Assignment: All students will be assigned a one or two digit class number. This number will be used for checking out equipment, on labs, and tests. The number makes it easier to keep track of things.

Late Labs: I will allow for late labs (labs past the end of the assigned date), but be careful, you can fall behind very quickly. There is no lab time on the week of the final exam.

Other Things:

The math for this class will be very simple, add, subtract, multiply, and divide are all you need to know.. Index cards are allowed for notes in any test as long as the cards are <u>hand written</u>. There is no limit on the number of hand written cards you may use in a test.

I will allow for a spiral folder for your notes. I do not allow for loose sheets of paper for notes during a test.

Calculators will NOT be allowed in a test.

My Office Hours are right after this class (Tuesday & Thursday). If you wish to talk with me, please be sure to let me know that night. If no one requests my time that night, I will not be staying around waiting for anyone.

OPTIONAL:

Many students want to bring their own laptops and purchase their own
boards to use in class. You may do so if you wish. If you purchase
from Microchip, and use the ".EDU" email address, you will receive an
educational discount. Last time I checked it was 25% off.

Part Number : **DV164120** - PICkit 2 Starter Kit

The PICkit 2 Starter Kit contains the
materials shown to the right. A slight
modification to the board allows you to be
able to prototype your circuits a bit
easier. The changes are covered on a
different document. By going to the
Microchip web pages and searching for
"DV164120", you'll find this kit.

LIST = $54.99   ($41.24)

Part Number : **DM164120-1** - PICkit 2 Low Pin Count Demo Board

The DM164120-1 comes with a small demo board
with a PIC16F690 on board and a small prototype
area. The kit also includes two bare PCB boards
for those interested in customizing their
development. While you don't need to order this,
it gives you extra boards for development. One
could use a blank board with a ZIF socket,
capacitor, and header to make a simple
programmer.

LIST = $25.99   ($19.49)

Orders placed on microchipDIRECT (http://www.microchipdirect.com) for
email addresses with an **".edu"**, ".k12", ".ac", etc in the domain name
will receive an automatic discount of 25% off of list price on
Microchip development tools.

It may still be possible to obtain up to 3 chips as samples for free.
If still true, first get the **16F505**, then get the **16F690**.

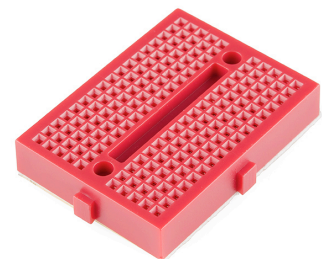---

Breadboard - Mini Modular, PRT-12044 or PRT-12046 or PRT-12047 $3.95

These small breadboards fit nicely onto PICkit-2
demo boards to allow a prototyping area to build
circuits.

https://www.sparkfun.com/products/12044

https://www.sparkfun.com/products/12046

https://www.sparkfun.com/products/12047

				Instructions	Lecture/Book	Lab
1	**T**	21	Jan		Intro	**Setup**
	Th	23	Jan	MOVLW, MOVWF		
2	**T**	28	Jan	NOP, GOTO	Chapter 1	Lab 1
	Th	30	Jan			Group Lab
3	**T**	4	Feb	DECF, INCF	Chapter 2	Lab 2
	Th	6	Feb	MOVF, ANDLW		
4	**T**	11	Feb	DECFSZ, INCFSZ	Chapter 3	Lab 3
	Th	13	Feb	CALL, RETURN		
5	**T**	18	Feb	BCF, BSF	Chapter 4	Lab 4
	Th	20	Feb	BTFSC, BTFSS		
6	**T**	25	Feb		Review, if time allows	**None**
	Th	27	Feb	**Test #1**		
7	**T**	4	Mar	ADDLW, ADDWF	Chapter 5	Lab 5
	Th	6	Mar	SUBLW, SUBWF		
8	**T**	11	Mar	RLF, RRF	Chapter 6	Lab 6
	Th	13	Mar	COMF, RETLW		
	T	18	Mar	**Spring Break**	---	---	---
	Th	20	Mar	**Spring Break**	---	---	---
9	**T**	25	Mar	ANDLW, ANDWF	Chapter 7	Lab 7
	Th	27	Mar	IORLW, IORWF		
10	**T**	1	Apr	CLRF, SWAPF	Chapter 8	Lab 8
	Th	3	Apr	XORLW, XORWF		
11	**T**	8	Apr		Review, if time allows	**None**
	Th	10	Apr	**Test #2**		
12	**T**	15	Apr	CLRW, RETFIE	Chapter 9	Lab 9
	Th	17	Apr	CLRWDT, SLEEP		
13	**T**	22	Apr	OPTION, TRIS	Chapter 10	Lab 10
	Th	24	Apr			
14	**T**	29	Apr		Chapter 11	**Project**
	Th	1	May			"
15	**T**	6	May		Chapter 12	"
	Th	8	May			**DUE**
16	**T**	13	May		Review, if time allows	**None**
	Th	15	May	**Final Exam**		

Every effort will be made to follow this schedule, however, life is full of surprises. This schedule may be subject to change.