**CLASS OUTLINE & SYLLABUS**

**MECHATRONICS-14**

Curriculum:   Fundamentals of electronic fabrication.  Chassis and metalwork principles and practice.  Circuit design and test.  PC board design, fabrication, and test.  Elementary drafting techniques.  Introduction to computer aided drafting and pc board layout.

Text:  The text is completely online (www.rstengineering.com/sierra) and there is no other text necessary.

Programs:   "Mechatronics" is the computer control of machinery.  Since the computer is to be integrated into the curriculum, we will be learning to use three main computer programs for our work.

- The first program is a standard drafting program called "**AutoSketch**".  This program will form the basis for our metalwork and some of our printed circuit work.  It is downloadable from the class website.

-  Another program is a spreadsheet called "**Excel**".  We will be using Excel to keep track of our drawings and do other minor calculations.

- The last program is called "**CircuitMaker/Traxmaker**".  We will be using CircuitMaker to do schematic drawings and Traxmaker to do PC board layout and check.  It is downloadable from the class website.

- Please note:  You are welcome to use your personal laptop or other computing device in this classroom but ***I cannot troubleshoot why a particular program or routine will not work on your machine.  All the Sierra class laptops are guaranteed to work with all of our programs. Please don't ask me why the programs do not work on your personal devices.***

- The class laptops are programmed to erase ALL work done on them when they are shut down for the day.  Any work you have done will be erased upon shutdown.  ***SAVE ALL YOUR WORK TO A PORTABLE DRIVE OR EMAIL IT TO YOURSELF BEFORE YOU TURN THE COMPUTER OFF.***

Eye Safety:

- Personal protective eye wear conforming to ANSI Z87.1 must be worn by every student in the classroom any time there is a potential hazard that could adversely affect a person's eyes and/or face (Examples:  cutting, drilling, shearing, or other metalwork; cutting or clipping wires or component leads; etc.).  You must furnish your own eye protection which can be purchased at an automotive parts retailer, hardware store, or from the MECH Robotics Club for $5.  You are required to bring and use your protective eye wear during every laboratory session.

**Eye protection must be worn at all times in the machine shop area and at any time soldering is being done in the lab room.  I will counsel you on the first infraction of this rule and I will drop you from the class ... no questions asked ... the second time.**

Standards:

- This class is set up to do work in INCHES and DECIMAL PARTS OF AN INCH.  That is, if a measurement is half an inch, don't say ½", use the decimal system of notation 0.50".  The computer programs are designed to use the inch.decimal system of notation.

Grading:

- *There are no quizzes or examinations.  Most of the grade is dependent on the production by each student of a class project, a small voltage variable power supply.  If the chassis is completely fabricated correctly, the grade is C.  In addition, if the PC board is completed and work-ing, the grade is B.  In addition, if the PC board is mated to the chassis and the whole project works **along with the final written report** the grade is A.  I also reserve the right to assign "participation points" for taking part in class discussions.*

Quizzes, Homework, & Exams:

- None.

Final Project Work:

- The entire structure and focus of this class is the "production" of a small bench power supply.

- "Production" has two facets to it.  One is the actual hand-fabrication of the chassis and pc board to make the prototype power supply.  The other facet is the documentation package that needs to go with the prototype to turn it into a production unit.  Attached you will find what I consider a "perfect" final project documentation package.

- *There will be no other required written items, including lab reports from each week's class.  There will be four times during the semester that I will want to see your notebook to be sure that you are staying up to date.  There will be NO grade given for these checkups.*

Attendance:

- Up to four unexcused absences will not affect your grade, but you must make up the work that was missed.  At six absences, I will ask you to drop the class.

Time:

- The formal class time is four hours long.  There is space for ten minutes of "break time" in each of these hours.  You are welcome to take one forty minute break, two twenty minute breaks, four ten minute breaks, eight five minute breaks, or however you wish to arrange your break time.  You are adults; I'm not holding a stopwatch on you.

- HOWEVER, if your job works right up to class time and are going to be continuously five or ten minutes late, just tell me so that I know.  It doesn't bother me to accommodate your work hours.

- It is also true that some of you will work faster than others.  Some have done this stuff before, and others are brand new to it.  The assignments are given so that 95% of the class will be able to finish the project in the allotted time.  That means that most of you will finish early.  To try and reach a compromise between coming in late and leaving early, I will take roll at one hour before class is officially over.  If you have completed your assignment and wish to leave early, so be it  -- or you can help your fellow students who are having difficulty (and thus gain "participation" points).  If you have to leave for a personal necessity, have your lab partner just answer "(s)he had to leave early" and I'll so note.  If you want to work late or make up some time, I'll stay an hour late if you wish.

Office Hours:

- I will be in the classroom for a half-hour before every class.  If you need a private space in which to talk to me, I will make a private office available.  Just ask.  No problem.

Website:

- There will be a website on my personal business web page at *www.rstengineering.com/sierra* with the notes for all prior weeks, the class grades as I have them, the text, drawings, and other items of interest for your download pleasure.

Required Equipment:

- Safety Glasses to ANSI Z87.1.  If you wish to leave your glasses in the classroom between lessons I will provide a container in which to keep them.  You are required to label them with your name.

- A calculator with the ENG function.  NOT the E function or the • function, NOT the ^ function, the ENG function.  I will explain in class.  These calculators are widely available at Staples and other office supply stores as "scientific calculators".  PLEASE do not buy an expensive graphing calculator or a calculator that can be programmed to turn on the coffee in the morning.  The CHEAPEST calculator you can buy with the ENG function would be preferable.

- o At the present time, the Casio models FX 115, FX 260, and FX 300, and the TI 30Xa have proven to be very capable of doing all the math required in the MECH program

    - I will NOT be able during class to take the time to teach you how to use your calculator. We may do some simple problems in class to be sure you know how to use your calculator, but there is just not enough time for one instructor to show 24 students how to use 24 different calculators. Please practice with your calculator at home until you know how to use it.

- A thumb drive (jump drive, USB drive) of at least 2 GB capacity. Again, a very few dollars at any electronics/office supply store (Frys, Staples, Best Buy, Office Max, etc.).

Learning Outcomes:

- By the end of the semester, you will be able to --

    1. Develop a basic design, develop working drawings and then lay-out and construct electronic chassis, panels, and assemblies commonly used in the electronics industry using a variety of tools and techniques.

    2. Demonstrate proper application of soldering and wiring techniques through the completion of point-to-point and surface mount circuit boards.

    3. Develop either a single or double-sided printed circuit board layout from a schematic diagram using standard PC based CAD software.

    4. Understand the PCB photo tool creation and exposure/etch process.