

**Sabin-Schellenberg Professional Technical Center  
North Clackamas School District  
Course Syllabus  
2011-2012**

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**Phone:** (503) 353-5910 ext. 37620

**HS Course Title:** Electronic Technology 3– Robotics  
**CCC Course Title:** Intro. To Microcontroller, EET254  
**Focused Program of Study:** Industrial Engineering  
**Web address:** <http://www.nclack.k12.or.us/ssptc/site/>  
**ACC website:** <http://depts.clackamas.edu/acc>

- I. **Course Description:** A study of robotic systems, components and how to apply this theory to engineer robots. Strong Product emphasis involves students in hands-on learning in this every day class. Introduction to Motorola 68HC12 microcontroller. Internal structure, registers, busses, control unit. Clock, machine and instruction cycle timing, interrupts and DMA. Instruction set, mnemonics, functions, and assembly language programming. Interfacing to external memory and I/O on-chip peripherals.
- II. **Course Overview:**  
Mechanical-Electrical systems, Assembly Software & Microprocessor PIC programming, Gear box calculation / fabrication, Mechanical Advantage, Motor control fundamentals, Bipolar & MosFET control circuits and H Bridge design. CRLE opportunity. Products designed include Robot chassis, Robot "Brain" (PIC Program), Infrared Sensors, H-Bridge controller and Robot motion controllers. A review of the structure & configuration of computer systems and Microcontrollers (PIC's) are also covered.
- III. **Student Learning Outcomes:**  
At the successful conclusion of this course the student should be able to:  
Understand Motorola 68HC12 microcontroller. Internal structure, registers, busses, control unit. Clock, machine and instruction cycle timing, interrupts and DMA. Instruction set, mnemonics, functions, and assembly language programming. Interfacing to external memory and I/O on-chip peripherals
- IV. **Class Expectations:**
- **Come to class on time and be ready to participate.**
  - **Be respectful of others and the equipment.**
  - **Follow all safety standards and clean-up after yourself.**
  - **Use the time during class appropriately.**
- V. **Homework Policy:**
- Work that cannot be completed during class time becomes homework.
  - Lab make-up work must be pre-arranged with instructor.
- VI. **Grading Policy:**
- Grades will be posted in the class room and are based on a total points system with 90-100%= A, 80- 89% = B, 70- 79% = C, 60- 69% = D, below 59%= F
  - Employability score or Participation points are based on Safe work habits, attendance/supervision, materials management, professionalism, and initiative.
  - Students will be graded based on Notebooks, worksheets, Lab write-ups, Hardware projects and project documentation. Assessments are based on correctness, completeness, craftsmanship, and quality of documentation.
  - Late work is only accepted by prior arrangement with instructor

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**VII. Attendance Policy:**

- Participation points can be earned on a 10 points per day basis. The participation points are based on employability skills such as: safe work habits, attendance, use of equipment and time management – and will be no more than 25% of the total points.
- Student must attend class to receive participation points.
- Students who miss class for ANY reason, must obtain the homework or assignment from another student BEFORE discussing the assignment with the Teacher.

**VIII. Safety policy:**

- All students are required to pass safety unit and Safety glasses required in fabrication areas.
- Loose clothing and hair must be secured when using power equipment.
- Violation of safety guidelines may result in alternate non-lab assignment or district discipline measures

**IX. Student Conduct:**

Because this class is a dual credit class, earning high school and college credit, you are held to student conduct policies for the high school and Clackamas Community College. Please refer to the HS Student Handbook and the College Handbook (

<http://www.clackamas.edu/documents/handbook.pdf>)

**Course Outline:**

- 1) Review of basic electronics, formulas and safety.
- 2) Lab experiments with electro-mechanical systems, gear box controllers and motion controllers.
- 3) Students build a robot kit- assemble, solder and test the robot.
- 4) Students test the motor controls of the robot, analyze functions of the sub-systems and design & build a new H-Bridge control system for the robot.
- 5) Computer systems review: structure, connections & configurations of the typical computer system are reviewed. (Processor, Memory, Bus systems & I/O)
- 6) Assembly Software: Microcontrollers – PIC programming – students learn the functions and programming language by completing several labs that demonstrate the functions & capabilities of the MicroChip – PIC 16 F 84A device.
- 7) Sensors and controls: students experiment with IR senders & receivers, test the functions and design requirements.
- 8) Putting it all together:  
Students convert the straight ahead walking robot kit with a reverse interrupt sensor, into an Autonomous Robot -
  - Students design a “Brain Board” using the PIC 16 F 84A, develop the input sensors to the PIC and the PIC then controls the H-Bridge or the motors of the robot.
  - Students program the PIC with interrupt sub-routines and special commands so the robot will move in a prescribed pattern unless interrupted by an object.

**Retain these page for your records**

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**Return this page to the Teacher**

**I / we have reviewed the Electronic Technology 3– Robotics Syllabus, I / we understand the class expectations and policies.**

**PRINT STUDENT NAME HERE \_\_\_\_\_**

**Student Signature \_\_\_\_\_**

**Parent /Guardian Signature(s)\_\_\_\_\_**

**Parent /Guardian Contact Info: Phone or email \_\_\_\_\_**