

# MURRIETA VALLEY HIGH SCHOOL Computer Integrated Manufacturing

MR. BRADLEY

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# **Course Description:**

Welcome to Computer Integrated Manufacturing! Computer Integrated Manufacturing (CIM) is the study of manufacturing planning, integration, and implementation of automation. The course builds on computer solid modeling skills developed in Introduction to Design. Students will use Autodesk Inventor and HSM CAM software that will run our Shopbot CNC router and/or our Haas CNC Mill to produce tangible models of their three-dimensional designs. Students will also learn how to set up and run the 3d printers and a laser cutter/engraver. In addition, students will use VEX robotics and Lynxmotion robotic arms to explore the fundamental concepts of how robotics is used in automated manufacturing.

# **Course Objectives:**

Upon the successful completion of this course, the student will be able to:

- 1. Explore manufacturing through research and projects.
- 2. Explain the different procedures used in manufacturing.
- 3. Create a flowchart that portrays a manufacturing process.
- 4. Identify a control system and explain its application to manufacturing.
- 5. Model and create a program to control an automated system.
- 6. Create a control system that replicates a factory cell.
- 7. Maximize the efficiency of the manufacturing system with respect to time and cost.
- 8. Use knowledge of design to analyze products with flaws.
- 9. Use calculated volume, mass, surface area of parts to determine material cost, waste, and packaging requirements.
- 10. Use solid modeling software to improve a flawed design.
- 11. Create a product using solid modeling software.
- 12. Analyze a product to propose the manufacturing processes used to create it.
- 13. Explore prototyping processes
- 14. Identify machines when given a process and identify the process that a given machine performs.
- 15. Determine the appropriate feed and speed rate for a given material using a tool with a given diameter.
- 16. Read and interpret G & M codes.
- 17. Transfer the drawings made in CAD to a CAM program.
- 18. Create numerical code using a CAM program.
- 19. Create parts using the machines demonstrated by the instructor.
- 20. Identify the advantages and disadvantages of robotic labor versus human labor.
- 21. Create and program virtual robotic work cells with simulation software.
- 22. Program the interface between a robot and another machine.
- 23. Solve problems involving electrical, pneumatic, and mechanical power.
- 24. Convert power between units.
- 25. Construct a system to convert pneumatic power into mechanical power.
- 26. Learn the programming language needed to operate the Lynx robot.
- 27. Create programs using robotic software that will allow the robot to perform a set of tasks.
- 28. Configure servo motors to operate the Lynxmotion robot.
- 29. Identify the components of a Flexible Manufacturing System (FMS).

- 30. Create a process design chart for a manufacturing process.
- 31. Identify the potential safety issues with a CIM system and identify solutions for these problems.
- 32. Design a manufacturing system that contains at least two automated components.
- 33. Complete the construction of each individual component of the miniature FMS and verify that each component works.
- 34. Assemble components into a working miniature FMS.
- 35. Refine each component to improve the total process flow and cycle time.

## **Required Text:**

There will be NO text for this class. All information will be provided through PowerPoint, teacher discussion, or online (Learning Management System aka LMS). Students will be able to access all class material via the LMS from any computer with internet access.

## Course Outline (subject to change)

#### **Unit 1 Principles of Manufacturing**

- History of Manufacturing (2 days):
- Control Systems (5 days):
- The Cost of Manufacturing (5 days):

## **Unit 2 Manufacturing Processes**

- Designing for Manufacturing (9 days):
- How We Make Things (12 days):
- Product Development (6 days):

## **Unit 3 Elements of Automation**

- Introduction to Automation (10 days)
- Elements of Power (5 days):
- Robotics Programming and Usage (8 days):

## **Unit 4 Integration of Manufacturing Elements**

- Types of CIM Systems (2 Days):
- Integration of Manufacturing Elements (18 Days):

#### **Required Materials**

- Engineering Notebook Quad Ruled
- Binder with index dividers and paper
- Blue or Black pens
- Mechanical pencils
- Calculator

#### **Classwork**

- Daily assignments 10-20 points
- CAD and Robotics assignments 10-25 points
- Projects 25-100 points
- Notebook Checks 25-75 points
- Final Exams 100 points

Grading Scale									
A+	97.00 - 100	B+	87.00 - 89.49	C+	77.00 – 79.49	D+	67.00 - 69.49	F	0 - 59.49
A	92.50 - 96.99	В	82.50 - 86.99	С	72.50 – 76.99	D	62.50 - 66.99		
A-	89.50 - 92.49	В-	79.50 - 82.49	C-	69.50 - 72.49	D-	59.50 - 62.49		

#### MAKE-UP WORK POLICY:

Students will be given no more than one week to complete an assignment before it would be considered late. It is the student's responsibility to follow through, complete assignments and submit by the due date.

Students can make up assignments at home, during class, and after school. Assignments not completed within the 6 week grading period will not be accepted at a later date!

#### LATE WORK / ASSIGNMENT POLICY:

Late work must be submitted within each six-week grading period that it is assigned. Students will be reminded of missing assignments during the class period and are encouraged to check ABI and/or PLTW's LMS to verify scores and their current grade.

If assignments are not turned in on time, the following grading system will apply:

- One day late minus one letter grade (from total score)
- Two days minus two letter grades (from total score)
- Three days late or more half of the total score

Students are responsible for and should not discard any assignments until the final grade has been posted in ABI.

\*Students can make arrangements to come in before and/or after school to make up work. I am usually here before school by 7:00 a.m. and stay after school M, W, F until 3:30 p.m.

#### ACADEMIC HONESTY STATEMENT

Academic dishonesty includes but is not limited to: cheating, copying from other sources (on-line courses, any internet site), homework turning in work done by parents, projects, tests, notes, using notes without permission, forging, altering or duplicating school or teacher documents or signatures, plagiarism and text messaging regarding test data or information. The 'l' (Integrity) from our school's motto, will be enforced.

#### **Classroom Management**

- A copy of the Student Code of Conduct can be found in the MV Guide.
- I expect you to read and understand that code.
- I will try my best to observe all of the points in that code.
- I expect you to be in your seat each day ready to learn, and able to act respectfully to yourself and to others.
- You cannot learn if you do not respect the rules, others, yourself, and your teacher.
- Every day when you walk through that door, I will do my best to inspire, motivate, and teach you about various manufacturing processes.
- I will expect the same from you.

#### <u>Miscellaneous</u>

- If there is a problem, big or small, let me know.
- It's best to talk to me in private if the situation requires it.
- Once we have spoken, I will do my best to fix the situation.
- The best way to contact me is by email.
- My email address is at the top of this document.
- I will try to answer phone calls and emails within 24 hours.

#### PLEASE GET A QUAD RULED ENGINERING NOTEBOOK BY MONDAY - WORTH 10 POINTS

## 10 Point Homework Assignment Due by 11:59pm Tuesday for 10 points

In an effort to go paperless your parent will send me an email stating that they have looked over the course syllabus with you.

Directions -

- 1. Please have one of your parents send me an email to <u>kbradley@murrieta.k12.ca.us</u> with your period, first, and last name in the subject line.
- 2. Example 2 Sarah Snyder
- 3. Please have your parent include their contact info including email (if different from one they are sending from) and preferred phone number.
- 4. If you or your parent has any questions please include them in the email.