Course Outline and Syllabus-CAD/CAM 2

Instructors Name: Mr. Smith  
Email Address: msmith@morrishs.org  
Location: Room 304

Course Description: CAD/CAM 2 is designed to help the student acquire knowledge and skill in the use of numerical control (NC) and computer numerical control (CNC) using our Laguna CNC Router. The course will also include NC and CNC general concepts and programming procedures using G and M codes. Students will have hands-on experience in manually programming, and setting up a CNC Router. Students will become familiar with Windows, AutoCAD, and Mastercam to aid in programming our Laguna CNC Router. People who can build, repair, operate, program CNC equipment are in high demand. The ability to apply math, science, and design concepts to complex problems is becoming increasingly important. The class is designed to prepare students for the world of work, advancement to the local community college, or a four-year university under the umbrella of engineering and manufacturing.

Books, Supplies, & Supplemental Materials: 3 ring binder with pockets for handouts and note taking, Safety Glasses, Tape Measure (Student can purchase a tape measure from MCHS Ind. Tech. program for $3) There is a $30 project cost due by end of second week of class.

Methods of Instruction:
- Lecture/Demonstration
- Computer work/Email/box.com
- Lab Activities

Student Learning Outcomes

Technology Foundation Core
- Student will develop an understanding of the characteristics and scope of technology
- Student will develop an understanding of the core concepts of technology
- Student will develop an understanding of the relationships among technologies and the connections between technology and other fields of study
- Student will develop an understanding of the cultural, social, economic, and political effects of technology
- Student will develop an understanding of the effects of technology on the environment
- Student will develop an understanding of the role of society in the development and use of technology
- Student will develop an understanding of the influence of technology on history

Design Process Core
- Student will demonstrate an understanding of the attributes of Design
- Student will demonstrate an understanding of the Engineering Design Process
- Student will demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving
- Student will be able to apply the design process
Leadership and Employability Core
- Student will develop and understand individual leadership skills
- Student will develop and understand group leadership skills
- Student will develop and understand community and career leadership skills
- Student will demonstrate knowledge of career options
- Student will demonstrate knowledge of education and training options
- Student will demonstrate a commitment to quality
- Student will demonstrate positive work habits that are desired by industry
- Student will be able to communicate effectively with others
- Student will become interpersonally effective
- Student will develop positive attendance and punctuality habits as desired by industry

Designed World Core
- Student will utilize math skills to interpret drawings of parts to be machined
- Student will use the Cartesian Coordinate System to interpret date on parts to be machined
- Student will use the Cartesian Coordinate System to describe tool paths
- Student will use G and M and other CNC codes to define machine operations
- Student will write CNC programs with proper headers and footers
- Student will use variables to create efficient CNC milling programs
- Student will correctly transfer CNC programs to and from CNC Router
- Student will edit CNC programs
- Student will produce complete CNC program documentation

CAD/CAM/CNC Core
- Student will translate drawing between CAD and CAM software
- Student will create and edit geometry using CAD and CAM software
- Student will create basic tool paths using CAM software
- Student will correctly plan the sequence of machining operations
- Student will correctly set up machining parameters
- Student will merge CNC programs

CNC Set up and Operation Core
- Student will turn on and initialize CNC Router
- Student will properly turn off CNC Router
- Student will download a CNC program from a computer to CNC Router
- Student will upload a CNC program from CNC Router to a computer
- Student will use CNC control panel to edit a CNC Program
- Student will select and prepare work holding device(s) to hold parts of CNC machining operations
- Student will select and install proper cutting tools for CNC machining operations
- Student will Zero set CNC Router so machine knows where the works piece is
- Student will offset tool length on all tools so machine knows the length of each tool and the location of each tool tip
- Student will offset the tool radius on appropriate tools
- Student will run CNC program for a new setup without a tool crash
- Student will calculate and make minor tool adjustments to produce parts within spec

AutoCAD and Mastercam Core
- Student will AutoCAD, Mastercam, and sketching tools to create geometry
- Student will create working drawings from parts
- Student will create assembly models
- Student will present designs in a variety of formats
- Student will analyze designs

General Education Outcome:
- Students will demonstrate the ability to accurately apply correct mathematical methods and techniques in various applications such as contextual sciences, contextual mathematics, contextual physics
- Students will demonstrate ability to understand the physical world
- Students will demonstrate competence in using academic technology including finding, evaluating and utilizing appropriate information sources
- Students will demonstrate the ability to think critically and analytically

Leadership Development
- Student will think critically about organizing project
- Student will direct CAD/CAM 1 student with scope of project
- Student will learn leadership skills
- Student will teach CAD/CAM 1 student
- Student will direct CAD/CAM 1 student towards correct CNC maintenance
- Student will instruct CAD/CAM 1 students within the AutoCAD environment
- Student will instruct CAD/CAM 1 students within the Mastercam environment

Graded Assignments & Policies:
Students can correct assigned work, and quizzes, according to the grading comments. The corrected work accompanied by the original work may be resubmitted for consideration of a higher grade. The resubmitted process ends at the end of the final week of class. Grades are based on the individual performance; no curve is applied. **If homework is not completed, student will not be allowed to continue working in the shop until homework is completed.**

Evaluation & Grading Scale: (all homework, quizzes, and exams are take home and can be accessed at www.box.com)
The grade will be on a percentage system with points assigned to each activity assigned. The following schedule is an estimate of the work that will be include in the final percentage total. Should items be eliminated the same percentages will stand for the adjusted point total. The student’s grade is based on the individuals completed and correct work.
Morris Community High School – Mr. Smith
Industrial Technology/Pre-engineering Program

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<table>
<thead>
<tr>
<th>Activity/Points</th>
<th>Percentage</th>
<th>Grading Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes (180 pts.)</td>
<td>15%</td>
<td>100-92 A</td>
</tr>
<tr>
<td>Team Project (624pts.)</td>
<td>50%</td>
<td>91-83 B</td>
</tr>
<tr>
<td>Mid Written &amp; Drawing Exam (124 ea.)</td>
<td>10%</td>
<td>82-74 C</td>
</tr>
<tr>
<td>Final Written &amp; Drawing Exam (186ea.)</td>
<td>15%</td>
<td>73-65 D</td>
</tr>
<tr>
<td>Portfolio (125pts.)</td>
<td>10%</td>
<td>64-F</td>
</tr>
<tr>
<td>Bonus Points (7 @ 5pts = 75pts.)</td>
<td>2%</td>
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</tr>
</tbody>
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Classroom Polices & Procedures:
Homework is assigned on Monday and due on the following Friday. A 10% penalty will be assessed for homework assignments that are late. Projects will be assigned due dates based on class progress. Exams, Quizzes, and homework are take home assignments. All homework, quizzes, and tests can be accessed at www.box.com from anywhere in the world. This helps deal with students forgetting their work at school or home. The student can save all completed work to their own drop box folder giving them access to it at home or at school. This class utilizes handouts, drawings, and projects or portfolio as integral learning tools for the student. All written assignments will be submitted in a typed text format only. The quizzes and tests will be derived from material discussed during the lectures, handouts, and assigned reading. You may use your handwritten or typed notes on all quizzes and tests or as direct by the instructor.

Attendance:
Consecutive attendance is crucial to the development of the course materials and work habits. Students are expected to attend each class session. It is the student’s responsibility to obtain missed lecture notes, handouts, announcements and assignments for classmates. Any items assigned for that class are due on the following class date.

The lectures in this course build on the previous class lecture; regular attendance is strongly recommended to understand the material taught. The student is responsible for the material taught in a missed class. The student will complete all assignments, quizzes, test, projects and portfolio requirements.

No make-ups for missed class activities will be available for unexcused absences and as stated excused absences require that the work be made up in accordance with the student handbook.

Make-up Tests:
Midterm and Final Exams each are assigned a point value. Points are awarded for correct answers and demonstrated master of specific skills. Make up testing is allowed at instructor’s discretion and in accordance with student handbook.

Students will submit a portfolio of completed assignments chosen form the best examples of his/her homework. This may include work that has been revised/improved since the original grade was given. A title page and table of contents are to be included. Portfolios shall be suitably bound for presentation during job interviews.
Academic Honor Code:
The objective of the academic honor code is to sustain a learning-centered environment in which all students are expected to demonstrate integrity, honor, and responsibility, and recognize the importance of being accountable for their own academic behavior.

Academic Misconduct:
Morris Community High School Industrial Technology Department demands the highest standards of personal integrity and honesty. Examples of academic misconduct and plagiarism include copying the assignments (electronic files) of others, or allowing another to copy your work (electronic files); cheating on assignments, quizzes, or tests; and other examples as described in the student handbook. All consequences of misconduct will be dealt with in accordance with the student handbook.

Items needed every day for class:
- Pencil and 3 ring notebook
- Safety Glasses
- Tape Measure

Content Outline

Free Hand Sketching

Measurement
  Units
  Tooling
  Precision

Print Reading
  Read/Interpret drawings
  Scale and Linetype
  Terms

Parametric Modeling
  Basic Operation
  Modeling
  Documentation
  Assembly

Basic CNC Programming
  G and M Code
  Pockets
  Contours
  Tooling
  Feeds and Speeds

CAM Software Programming
  Set up
  Operations
  3-D Surfaces
  Post Processing

CNC Machining
  Safety
  Set up
  Operation
  Secondary operations

Industry Exposure
  Careers in Design and Manufacturing
  Career Planning
  Employable Skills
  What's Happening now

Leadership Development
  Individual
  Group
  Community and Career
  Opportunities
Industrial Technology Program Rules of Conduct

The Industrial Technology program uses both dangerous and expensive equipment, therefore the expectation of behavior in the classroom/shop is higher than the typical classroom. There are eight basic rules and all eight rules relate to shop safety, work skills, and being prepared for class.

**Classroom/Shop Rules**
1. No horseplay
2. No running
3. No foul language
4. No yelling
5. No behavior that interferes with others learning.
6. Bring necessary items to class, pencil, notebook, tape measure
7. Must be in seat before bell stops ringing

Since the potential for injury to the student and the equipment is higher than the traditional classroom setting, the consequences are higher than those found in the student handbook. **The first time or anytime a student does not adhere to the classroom/shop rules, they are assigned a 1/2 hour of service work to be served in the shop or classroom. Infractions of a more serious nature will be dealt with on case by case basis.** Student’s 1/2 hour of service work will consist of program related schoolwork, repairing/maintaining shop equipment, maintaining shop cleanliness, or any other school related activity that will help the student and the program. This not only enforces the idea that safety and preparation come first, but also helps enforce expectations with real world consequences and helps build positive ownership in the program.

**The reason for this is simple. If we keep the standard high, the chance of injury or mishap is greatly reduced. I have used this process for years and consequently have never had a serious mishap with a student or piece of equipment.**

Please complete the spaces below and return this sheet to Mr. Smith. Student will receive points towards their grade if turned in on time. Student will receive diminished points based on date turned in after due date. If not turned in by end of first week of class, student will not be allowed out into the shop.

**Student**
Written Name ______________________________ Email_______________________________
Signature _________________________________ Phone _______________________________

**Parent/Guardian**
Written Name ______________________________ Email_______________________________
Signature _________________________________ Phone_______________________________