MET 452.1
Mechanical Engineering Technology
Spring 2010

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Office and office hours: 213c REDC. Tuesday 1:25 – 2:25
Wednesday 10:00 – 11:00
Thursday 1:25 – 2:25 and by appointment

Course Title: Rapid Prototyping, Elective Course

Course Meeting Day, Time, and Location:
MET 452.1: Monday & Wednesday; 3:35 pm – 4:25 pm 206 REDC
Tuesday 9:05 am – 10:55 am 014 REDC

Course Description: Introduction to the production of prototypes directly from computer models.

Prerequisite(s): IET 216, MET 306

Textbook(s) and or other required material (supplemental/web pages):
Web pages located at: http://engr.bd.psu.edu/forsman/
Sculpy® Oven-Bake Clay – 1.75 lb box
Access to a color printer

Course Objectives:
After completing this course, students should be able to:

1. Understand the advantages and disadvantages of different additive processes currently on the market.

2. Develop an expertise in surface modeling so as to quickly produce 3-D sculpted surfaces not easily reproducible using solid modeling tools.

3. Reverse engineer a product by digitizing geometry, importing the data into Pro/ENGINEER and creating a solid model from surfaces.

4. Build the model (Objective 3) on a 3-D printer. Digitize a part using a non-contact scanner to verify the geometry against the CAD model.
5. Create CNC tool paths for three axis milling operations including volume, local, contour and trajectory, using Pro/MFG on the CAD model.

6. Check tool paths for accuracy using Vericut.

7. Post process all tool paths and execute them on a three axis CNC mill.

Topics Covered:

Pro/ENGINEER
- Copying references
- Planer curves
- Curves on surfaces
- Curve networks
- Boundary surfaces
- Boundary constraints
- Surface evaluation
- Warp
- Style curves and surfaces
- Redefining and modifying style geometry
- Surface continuity

Use of a Laser Scanner

Use of a 3-D digitizer

Varied Topics related to Additive and Subtractive prototyping

Class/Laboratory Schedule:
2 Fifty minutes Lectures and 1 one hour fifty minute Lab per week

Relationship of course to program outcomes:
Students should be able to integrate the basic CAD systems, manufacturing knowledge, and design techniques needed for successful product realization. (Program Outcome 3).

Students should be able to communicate their ideas and solutions effectively in a variety of ways. (Program Outcome 9).

Calendar/Dates: The semester project takes the place of a final exam.
Grading Criteria:

Lab, Homework Assignments 35%

Subtractive and Additive Semester Project 65%

GRADE SCALE:

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<th>Grade</th>
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<tr>
<td>A</td>
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Attendance Policy: "A student should attend every class for which the student is scheduled and should be held responsible for all work covered in the courses taken." (See Policies and Rules for Students, Class Attendance (42-27) on the PSU website at http://www.psu.edu/ufs/policies)

Makeup Policy: Students who fail to attend will not generally be allowed to make up laboratories, quizzes, or exams unless a prior arrangement has been made. Note that in case of illness, funerals etc., the student is responsible to notify the instructor before the class begins and then must produce evidence which documents the absence.

Academic Integrity: Penn State Erie puts a very high value on academic integrity, and violations are not tolerated. Academic integrity is one of Penn State’s four principles to which all students must abide. Any violation of academic integrity will receive academic and possible disciplinary sanctions, including the possible awarding of an XF grade which is recorded on the transcript and states that failure of the course was due to an act of academic dishonesty. All acts of academic dishonesty are recorded so repeat offenders can be sanctioned accordingly. Students are encouraged to review more information on academic integrity which can be found at: http://www.pserie.psu.edu/faculty/academics/integrity.htm

Support Services:
Learning Resource Center: http://pennstatebehrend.psu.edu/academic/lrc/index.htm
Library: http://www.behrend.psu.edu/academic/library/index.htm
Computer Center: http://www.behrend.psu.edu/compcntr/comppindex.htm

Lab Safety: Not Required (Computer Lab)
Course Policies and Procedures:

- Homework assigned during the week is due the start of the class period designated on the web pages. Late homework will be docked a letter grade (10%) for each day late.
- Just as industry, where all job related documentation must be accessible by other people related to a project, all computer related course work must be available for instructor review on the P: drive. Create a new subdirectory (NOT under the Private directory) labeled MET_452 and place all your work for this class in this location. The purpose of this is for the following: If you have any questions regarding your assignment, you can stop by the instructors’ office (or e-mail him) and he can quickly map your drive space to bring up your work to be better able to answer your questions. In addition, while grading your assignment (the documentation which is usually turned in on paper), if there are any questions relating to your documentation, the instructor can access your files to resolve any questions. All computer files for the assignment must remain accessible on disk until the assignment is returned to the student. If the instructor needs to check the data files and these files do not exist in the MET_452 subdirectory, then the worst case scenario will be assumed.
- Final deliverables are due with two weeks left in the semester. The course is deliberately front end loaded to allow students to finish up their Senior Design Project etc. These last two weeks will be devoted to lecture material related to the Rapid Prototyping. Failure to attend each lecture during the final two weeks will result in a 3% reduction in the overall course grade for each lecture missed.
- Use of Electronic Devices:
  Cell phone use is not permitted in classrooms, computer laboratories or mechanical laboratories. All phones should be set to silent and must not be viewed during quizzes or exams. Ipods/Zunes/MP3 type devices are not to be used in classrooms or computer labs when an instructor is conducting a class or lab. These devices are not permitted at any time in any mechanical labs. Violations of the above will be considered a violation of the Academic Integrity policy and will be dealt with accordingly.

General Policies, Rules & Procedures:  [http://www.sa.psu.edu/ja/procedures.shtml](http://www.sa.psu.edu/ja/procedures.shtml)

Note to students with disabilities: Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for modifications or reasonable accommodations in this course, contact the Disability Specialist in the Office of Student Affairs, Room 115 Reed Union Building, 898-6111.

Evening Exams, if any: Does not apply.

Prepared by and date of preparation:  David R. Forsman, 1/6/2010