Department of Mechanical Engineering Technology

Course number/name:  
MECH 1201 Computer-Aided Manufacturing Systems

Credits/contact hours:  
3 credits, 2 class hours, and 2 lab hours.

Instructor/coordinator:  
Nathan Vaisman, Associate Professor of Mechanical Engineering Technology

Text book/title/author/year  

Specific course information

Catalog description:  
A continuation of industrial processes with emphasis on semi-production and the function of the methods engineer. Medium run production equipment setup, economy, tolerance, fixtures, CNC programing using CAD/CAM and related planning are covered. Also covered are press work, time and motion, machinability, feeds, speeds and job-cost estimating. Students’ end-of-term reports include completion of a finished product incorporating modern manufacturing methods.

Pre/Corequisites:  
IND 1112, MECH 1101 / MAT 1275

Required/elective/selected elective:  
Required for Mechanical Engineering Technology and Industrial Design Technology

Course learning objectives:  
1. Ability to apply design and engineering principles and use of the state-of-the-art CAD/CAE/CAM software.
2. Ability to identify, analyze, and solve technical problems related to the design of a manufacturing system.
3. Ability to communicate effectively using appropriate commercial codes and standards in homework and design project.
4. A desire and recognition of the need to incorporate the latest technologies in the course work – ability to engage in lifelong learning.
5. Ability to finish the assigned project with quality, to meet design deadline, to develop a continuous improvement strategy in the industrial project.

Course addresses ABET student outcomes: 3a, 3b, 3c, 3d, 3e, 3f, 3g, 3i, and PC-2

Brief list of topics to be covered:

- Computers and use of computers. Introduction to Master Cam software. Overview of the graphic user interface. Menu, ribbon bar, toolbars, function prompt, toolpaths, origin, graphic area, status bar, setting the toolbar states for milling. Setting the grid. Using menu functions to create geometry (line, arc, fillet, chamfer.) Discussion of different term project. The validity of similar projects in the industry.
• Setting up for designing of a three-dimensional wire frame drawing related to the term project. Create a list of parts included in the project. Calculate production and cutting times, horsepower scrap weight, densities, cutting speed for parts included in the project. Designing of parts of the project using major commands of the manufacturing CAD-CAM software. Practice on tutorial #1

• 2D geometry, tapping, contouring, pocketing, modifying the pocket. (Use of software) Creating a list of parts involved in the project. Design of separate parts Creating of operation sheets of the parts involved in the project. Selection of tools based on lot size for the project. Introduction of MRP for parts of the project. Setup, production and cutting time. Detailed cost estimating sheets. Selection and design of gages for quality control, developing of a flow process chart. Design, and selection of commercially available jigs, fixtures for specific production projects. Practice on tutorial #2 (support software)

• Learning of manufacturing software in creating of point position, rectangle, line, arc polar, and trim, mirror, tangent arc, break, join, and offset, rotate, polygon. Use of software knowledge in designing of project parts. Midterm evaluation. Practice on hand out sheets, and book exercises.

• Create toolpaths. Toolpaths operation Manager. Select stock of material. Select tools from the tool library. Contour the part. Machining of specific parts of the term project using CAD-CAM, CNC and other automation equipment. Punch presses, heat treatment of parts and special tool design. Practice Chapter 2 exercises and hand out sheets.

• Create 2D geometry, island pocketing, and import from the library. Set the machine type Create toolpaths, select tools, generate the CNC program. 2D transform. Toolpaths using rotate and mirror. Create parallel line, create a rectangle, trim and fillets, mirror and rotate the part. Create toolpath, set up the stock. Toolpaths verification on parts of the term project. Simulate the cutting operation. Practice using tutorial #3,4,5

• Understanding and consideration of production economics before purchasing equipment, robots and other automation equipment. Assembling the term project. Complete all drawings using available production software. Finalize all automation equipment. Compare prices of all purchased equipment from a point of investment return. Make adjustment on invested prices. Team evaluation of the project.

• Production of all parts involved in the term project. Assemble parts of the project. Discussion related to the term project, correction if necessary, to the project. Assessment of quality of the project. Future planning for a project. Review of the project, corrections and comments.