

MET-2990: PRODUCT DEVELOPMENT AND MANUFACTURE

Cuyahoga Community College

Viewing: MET-2990 : Product Development and Manufacture

Board of Trustees:

January 2020

Academic Term:

Spring 2021

Subject Code

MET - Mech Eng/Manuf Ind Eng Tech

Course Number:

2990

Title:

Product Development and Manufacture

Catalog Description:

Capstone Course. This course provides the opportunity of applying learned concepts and principles of mechanical products development, design, manufacture, and management, to accomplish production of parts, employing traditional subtractive manufacturing principles and or modern manufacturing principles, including additive manufacturing. Products development principles taught includes strategies for product development, product launches, supply chain and post launch product management.

Credit Hour(s):

3

Lecture Hour(s):

2

Lab Hour(s):

3

Requisites

Prerequisite and Corequisite

MET-1410 Computer Aided Manufacturing (required prerequisite for students pursuing Associates Degree in Manufacturing Industrial Technology) or MET-2151 3D Digital Design & Printing (required prerequisite for students pursuing Certificate in 3D Design and Manufacturing); or departmental approval.

Outcomes

Course Outcome(s):

Design a solution to address a given problem/need following the key elements of product development from concept through design to production.

Essential Learning Outcome Mapping:

Civic Responsibility: Analyze the results of actions and inactions with the likely effects on the larger local and/or global communities.

Objective(s):

1. Identify and utilize methodologies available in analyzing market trends.
2. Choose tools and methodologies appropriate for specific design and manufacturing needs.
3. Recognize resources available in analyzing new product design (NPD).
4. Determine if adequate resources are available to complete a project or design.
5. Discuss time constraints related to product ideation to implementation.
6. Discuss the cradle to grave concept in product creation.
7. Investigate and identify relevant manufacturing problems requiring engineered solution.
8. Design a production process applying quality control, cost analysis components, and marketability considerations.
9. Write standard technical reports.
10. Apply the appropriate knowledge and skills to resolve manufacturing problems.

11. Apply other relevant research to solve engineering and manufacturing problems.
12. Evaluate proposed solutions in terms of current skills and knowledge.
13. Determine the requisite knowledge and skills for the resolution of pending problems.
14. Apply the tools of project management to ensure timely project completion.
15. Design a new solution or build on past work to resolve designs or process problems.
16. Evaluate actual solution performance against expected outcome.
17. Experiment and re-design for proper operation.

Course Outcome(s):

Employ traditional and modern manufacturing tools, principles, and practices to produce and test design parts.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Apply learned principles and skills to analyze designs to identify production requirements.
2. Apply learned skills and knowledge gained to select cost effective and productive production processes to accomplish productions.
3. Implement subtractive manufacturing operations to accomplish productions.
4. Implement additive manufacturing operations to accomplish productions.
5. Test products for quality and functionality.
6. Write technical literature and products specs.

Methods of Evaluation:

1. Quizzes
2. Exams
3. Assignments
4. Course Project

Course Content Outline:

1. Preparation for New Product Launches
 - a. New Products – What Separates the Winners from the Losers and What Drives Success
 - b. Service Development
 - c. Open Innovation and Successful Venturing
 - d. Success Factors of New Product Development for Emerging Markets
2. Starting New Product Launches
 - a. Effective Practices in the Front End of Innovation
 - b. Getting Lightning to Strike: Ideation and Concept Creation
 - c. Portfolio Management for Product Innovation
 - d. Identifying Significant New Business Opportunities: The Magellan Process
3. Progressing with New Product Development
 - a. Obtaining Customer Needs for Product Development
 - b. User Research for Product Innovation: Qualitative Methods
 - c. Market Analytics
 - d. Social Media and New Product Development
4. Achieving Results
 - a. Managing the Supply Chain Implications of Launch
 - b. Post-Launch Product Management
 - c. Understanding the Most Common Types of Intellectual Property Rights and Applying to Product Development Process
5. Computer Aided Manufacturing Processes
 - a. Manual CNC programming
 - b. Graphics base CNC Programming (Toolpaths generation) using chosen CAD/CAM software package
 - c. Toolpaths verification by simulation
 - d. Postprocessing toolpath programs to run on given CNC controllers
 - e. Setting up CNC machines to machine parts

- f. Operate CNC machines to produce parts
- g. Inspect and test machine parts for quality and functionality (where applicable)
- 6. Additive Manufacturing
 - a. Evolution of printing as an Additive Manufacturing process
 - b. Research achievements in printing deposition
 - c. Technical challenges of printing
 - d. Printing process modeling
 - e. Materials modification methods
 - f. 3-Dimensional printing
 - g. Advantages of binder printing
- 7. Guidelines for Process Selection
 - a. Selection methods for a part
 - b. Challenges of selection
 - c. Production planning and control
- 8. Business Opportunities and Future Directions
 - a. New types of products and employment
 - b. Digipreneurship
- 9. Economics of Manufacturing
 - a. Rational decision process
 - b. Time value of money
 - c. Rate of return analysis
 - d. Accounting for depreciation

Resources

Rehg, James A.; Kraebber, Henry W. *Computer Integrated Manufacturing*. 3rd Ed. Upper Saddle River, Nj.:Prentice Hall, 2008.

Besterfield, Dale H. *Quality Control*. 9 ed. Upper Saddle River, NJ.:Prentice Hall, 2013.

Valentino, James V. Goldenberg, Joseph. *Introduction to Computer Numerical Control*. 5th ED. Upper Saddle River, Nj: Prentice Hall, 2013.

Kahn, Kenneth B. et al. *The PDMA Handbook of New Product Development*. 3rd. Hoboken, New Jersey: John Wiley Sons, Inc., 2013.

Redwood, Ben; Schoffer, Filemon; Garret, Brian. (2018) *The 3D Printing Handbook: Technologies, design and applications* , Coers & Roest.

Cuffaro, Blackman, Covert, Paige, Laituri, Sears, Nehez-Cuffaro. (2013) *The Industrial Design Reference & Specification*, Beverly: Rockport Publishers.

Resources Other

1. Computer hardware, QC Computer Software Program, and/or Microsoft Office

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