

Division: Technical

Subject Code: ELME

Course: 105

Course Title: Manufacturing Fundamentals

Thaddeus Stevens College of Technology

Master Course Form

Catalog Description: This course provides the student with an overview of the various types of manufacturing that takes place in the discrete, hybrid and continuous sectors and of the jobs that must be performed within manufacturing. The course provides an introduction to the techniques and resources that manufacturers employ to improve operations, preparing the student for independent investigating and life-long learning. It provides basic knowledge and skills with regard to print/schematic reading, CAD drawing, measurement and quality assurance. At least one plant tour will be included as part of this course to provide first hand validation of the topics covered.

Digital Description:

- Credit Hours: 4
- Lecture Hours: 2
- Lab Hours: 6

Prerequisites:

- None

Minimum Grade Required

Corequisites:

- MATH 131 – Intermediate Algebra
or
MATH 207 – Pre-Calculus
- ELME 104
- ELME 107

Objectives:

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

1. Understand general industry safety and apply safety principles in the lab/field.
2. Learn how to use digital calipers
3. Learn how to use digital micrometers
4. Understand OSHA requirements for General Industry
5. Identify threaded fasteners and specifications
6. Understand quality assurance terminology and techniques
7. Interpret, modify, and create CAD prints/schematics
8. Describe the characteristics of discrete, hybrid and continuous manufacturing industries

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Competencies:

Upon successful completion of the course, each student will demonstrate the ability to:

1. Describe the role of manufacturing in the community and in the world economy
2. Describe the necessity for profit, how manufacturers make a profit and how that profit is affected by various internal and external influences
3. Describe how automation affects manufacturing and how capital investment is evaluated
4. Describe why some manufacturing has moved overseas while others has stayed in the USA.
5. Describe the importance of life-long learning
6. Describe the characteristics of discrete, hybrid and continuous manufacturing industries
7. Identify specific manufacturing companies within discrete, hybrid and continuous manufacturing industries
8. Identify the cost drivers within different segments of discrete, hybrid and continuous manufacturing industries
9. Describe the similarities and differences in equipment and automation within discrete, hybrid and continuous manufacturing industries
10. Describe the hierarchy of automation systems that may be used in manufacturing
11. Describe the purpose and function of automation systems that may be used in manufacturing
12. Describe the types of jobs available, the working conditions, the job expectations, the educational requirements, the expected compensation, and the career growth opportunities for different manufacturing companies
13. Describe the programs that manufacturers apply to improve performance such as Lean, JIT, SPC, TPM, and OOE and Determine Process Capability (CPK)
14. Define mechatronics
15. Describe the impact of mechatronics in manufacturing
16. Identify organizations, especially those with student membership, and periodicals that deal with the various aspects of manufacturing
17. Describe the purpose of the different type of engineering drawings that are used within manufacturing
18. Demonstrate the ability to read basic building layouts, process flows, mechanical, electrical, and piping drawings
19. Demonstrate the ability to use a computerized drafting system to make a simple drawing
20. Demonstrate the ability to make basic and precision measurements with tools including a temperature probe, machinist's rule, tape measure, dial caliper, micrometer, gage block, and indicator

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21. Convert units between fractions and decimals and between US customary units and SI metric units
22. Describe accuracy, resolution and tolerance

23. Collect measurement data
24. Enter measurement data using a computer and data acquisition software
25. Describe the function and application of statistical quality control
26. Understand how quality metrics such as X bar and R charts may interact with equipment troubleshooting.
27. Describe brainstorming techniques, cause and effect diagrams and Pareto Diagrams using both manual and computerized techniques
28. Apply brainstorming techniques, cause and effect diagrams and Pareto Diagrams using both manual and computerized techniques
29. Describe the principles of dimensioning and tolerancing including location, orientation and form tolerances
30. Apply the principles of dimensioning and tolerancing including location, orientation and form tolerances.

Planned Sequence of Learning Activities:

- o Orientation to Manufacturing/Workplace Readiness
- o General Knowledge
 - o Safety (OSHA)
 - o Tools
 - o Fasteners
 - o Print reading (FAMIC simulation)
 - Print/Schematic (electric, pneumatic/hydraulic) Reading
 - o Rigging & Mech. Installations
- o Quality Assurance
 - o Basic and Precision Measurement
 - o Introduction to Statistical process Control
 - o Control Chart Analysis
 - o Geometric Dimensioning and Tolerancing
 - o Tolerances: Location, Orientation, Form
- o Fundamentals of Project Management

List of Texts, References, Selected Library Resources or other Learning Materials:

1. Industrial Maintenance, Michael E. Brumbach, Jeffrey A.Clade. ISBN: 9781133131199, Cengage Learning
2. Safety Awareness eSeries

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3. Quality Control eSeries

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