# Part 1: Course Information

## Course Overview

### Basic Information

College:   
Department:  
Semester:   
Instructor:   
Office:   
Office Hours:   
Office Telephone:   
Email:

### Description

Introduction to High-Tech Manufacturing is a study of the basics of process control and automated manufacturing processes. This course consists of 15 lessons along with corresponding labs and/or class activities. Topics covered include safety, ergonomics, and hazard communication; measurement devices, simple machines, and basic electrical and fluid power systems; manufacturing efficiency techniques and industrial supply chain systems; troubleshooting techniques and strategies to identify, localize, and correct malfunctions; and total productive maintenance and quality improvement systems.

### Prerequisites

No Mechatronics courses are required as prerequisites.

To succeed in this course, students should be proficient in English and basic Algebra.

## Course Materials

### Recommended Textbooks

Workforce Florida, Inc. (2013). *Manufacturing Fundamentals Student Workbook, Unit 2: Safety Awareness* (2nd ed.). CreateSpace Independent Publishing Platform. ISBN-13**:** 978-1490365091.

Workforce Florida, Inc. (2013). *Manufacturing Fundamentals Student Workbook, Unit 3: Production and Processes* (2nd ed.). CreateSpace Independent Publishing Platform. ISBN-13**:** 978-1490368726.

Workforce Florida, Inc. (2013). *Manufacturing Fundamentals Student Workbook, Unit 4: Maintenance Awareness* (2nd ed.). CreateSpace Independent Publishing Platform. ISBN-13**:** 978-1490369174.

Workforce Florida, Inc. (2013). *Manufacturing Fundamentals Student Workbook, Unit 5: Quality Assurance* (2nd ed.). CreateSpace Independent Publishing Platform. ISBN-13**:** 978-1490369297.

### Additional Textbooks

Fogler, H. S. & LeBlank, S. (2013). *Strategies for Creative Problem Solving* (3rd ed.). Upper Saddle River, NJ: Prentice Hall. ISBN-13: 978-0133091663.

Goetsch, D. (2014). *Occupational Safety and Health for Technologists, Engineers, and Managers* (8th ed.). Upper Saddle River, NJ: Prentice Hall. ISBN-13: 978-0133484175.

## Course Structure

This course is designed to provide a hybrid experience, including both face-to-face and online activities. Activities to be completed online and face-to-face will be updated weekly and provided as a supplement to the course syllabus.

Contact time will be divided in the following way:

80% face-to-face  
20% online

### Face-to-face sessions

Laboratory exercises and in-class work will emphasize skill attainment and content mastery.

### Online Sessions

Online sessions will include content and activities from Platform +, Wisc-Online, Tooling U, simulated lab activities, and other resources. To access online activities, students will need access to the Internet and a supported Web browser. Technical assistance can be obtained from local technical support.

### Technical Requirements

* Internet connection
* Access to college learning management system and Platform+.
* Access to college email account
* Microsoft PowerPoint
* Microsoft Word

# Part 2: Learning Outcomes

Following successful completion of the Introduction to High-Tech Manufacturing course, the student will be able to:

**Applied Mathematics**

* Use basic algebraic and trigonometric equations to solve problems involving inclined planes, wedges, surface area, mechanical advantage, and basic mechanical equations.

### Critical Thinking/Problem Solving

* Use basic knowledge of fire, electrical, and machine safety to determine the best approaches to real-life situations.
* Describe the steps for creative problem solving, inspections, and data gathering related to quality assurance.

### Foundational Principles

* Correctly read and interpret basic measurement devices, such as hand-held tools and gauges.
* Explain the elements of industrial business, six sigma and lean manufacturing, and supply chain management, describing the impact of these processes on workers and businesses.
* Explain basic concepts related to mechanical systems, basic machining, electric motors, and fluid power systems.
* Explain the concepts and goals of preventative maintenance, total productive maintenance, quality management, quality circles, and quality control.
* Identify basic quality measuring processes.

**Technical Literacy**

* Read, analyze, and use technical documents, such as safety standards, standard operating procedures (SOPs), spreadsheets, schematics, industrial prints, blueprints, fishbone diagrams, flowcharts, spaghetti diagrams, control charts, graphs, histograms, and pareto charts.

### Troubleshooting

* Describe basic troubleshooting and problem solving techniques, particularly as they apply to areas of failure in mechanical components and the manufacturing process.

# Part 3: Course Calendar

This course calendar provides a schedule of lessons and an outline of topics covered. Activities, assignments, and assessments will be explained in detail throughout the course. Please contact the instructor with questions.

## Lesson 1: Introduction and Hazard Awareness Date

1. Class syllabus, Course Policies and Procedures
2. OSHA Safety Standards for Work and Home
3. OSHA Inspections, Violations, Penalties
4. When Inspections Occur (Priority)
5. Where Inspections May Occur
6. What Happens Before, During, After an Inspection
7. Workplace Hazards
8. Job Hazard Analysis
9. Quiz: OSHA

## Lesson 2: Hazard Communication and PPE Date

1. Forms of Hazard Communication
2. Safety Data Sheets (SDS)
3. Labels
4. DOT Placards
5. Signage
6. Hazard Communication Programs
7. Purpose
8. Elements
9. Quiz: Hazard Communication
10. Personal Protective Equipment (PPE)
11. Hearing Protection
12. Eye and Ear Protection
13. Respiratory Protection
14. Head Protection
15. Foot Protection
16. Hand Protection
17. Body Protection
18. Quiz: PPE

## Lesson 3: Fire Safety and Emergency Response Date

1. Fire Safety
2. Fire and How It Happens
3. Exit Routes
4. Fire Prevention
5. Plans
6. Portable Fire Extinguishers
7. Permanent Fire Systems
8. Emergency Action Plan (EAP)
9. Quiz: Fire Safety, Prevention and Emergency Action
10. Lock Out/Tag Out (LOTO)
11. Definitions
12. Purpose
13. Sequence of LOTO
14. Devices
15. Compliance with LOTO Procedure (Case Studies)

## Lesson 4: Electrical and Tool Safety Date

1. Electrical Safety
2. Injuries Caused by Electricity
3. Definitions of Electrical Terms
4. Main Electrical Hazards
5. Protection from Electrical Hazards
6. Warning Signs That Electrical Hazards Exist
7. Tool Safety
8. Causes of Machine Accidents
9. Machine Guard Requirements
10. Machine Parts That Pose Hazards
11. Types of Machine Safeguarding
12. Devices Used to Safeguard Machines
13. Examples of Machines and Appropriate Methods of Guarding Machines
14. Quiz: Electrical and Tool Safety

## Lesson 5: Ergonomics and Blood-borne Pathogens Date

1. Ergonomics
2. Definition
3. Musculoskeletal Disorders
4. Correct Posture and Positions
5. Contributing Conditions
6. Prevention
7. Blood-borne Pathogen Safety
8. Workers At Risk For Exposure
9. Ways Exposure Occurs
10. Key Aspects of Blood-borne Pathogen Exposure Control Plan
11. PPE and Housekeeping
12. What to Do If Exposure Occurs
13. Quiz: Ergonomics and Blood-borne Pathogens
14. Module 1 Exam

## Lesson 6: Introduction to Manufacturing Industry and Measurement Tools Date

1. Manufacturing Industry
2. Mass production
3. Types of manufacturing methods
4. Type of manufacturing processes
5. Measurement Tools
6. Manufacturing Variables, Instruments, and Use
7. Control of Instruments
8. Metric Prefixes
9. Hand Tools and Gauges
10. Quiz: Manufacturing Industry and Measurement Tools

## Lesson 7: Industrial Production, Six Sigma, and Lean Manufacturing Date

1. Industrial Production – Quality Tools
2. Concept of Quality
3. Benefits of a Quality Improvement-Centered Organization
4. Quality Improvement Tools
5. Statistical Just In Time Manufacturing
6. Six Sigma
7. Overview
8. Performance Levels
9. How Six Sigma Works
10. Fundamentals
11. Terminology
12. Key People in Six Sigma
13. Six Sigma Project Example
14. Lean Manufacturing
15. Traditional and Lean Manufacturing Compared
16. Lean Principles
17. Lean Project Example
18. Quiz: Industrial Production, Six Sigma, Lean Manufacturing

## Lesson 8: Industrial Business and the Supply Chain Date

1. Industrial Business
2. Business Basics
3. Business on the Production Floor
4. Supply Chain
5. Definition
6. Information in Supply Chains
7. Value Chain (including Definition)
8. Difficulties in Supply Chain Management
9. Challenges to the Production Technician
10. Quiz: Industrial Business and the Supply Chain

## Lesson 9: Electrical Basics and Introduction to Motors Date

1. Simple Machines
2. Overview
3. Lever
4. Wheel and Axle
5. Inclined Plane
6. Wedge
7. Screw
8. Pulley
9. Mechanical Systems (Compound Machines)
10. Definition
11. Associated Elements
12. Fasteners
13. Conveyor Systems
14. Machining
15. Traditional vs. Modern Machining
16. Machining Schema
17. Terms
18. Electrical Systems
19. Structure of Matter
20. Electricity and associated terms
21. Ohm’s Law
22. Power Law
23. Formula Wheel
24. Basic Resistive Circuits
25. Measuring Electricity
26. Electric Motor Basics
27. Electrical Current
28. Types of Motors
29. Advantages of Electrical Motors vs. Combustion Motors
30. Types of Electric Motors
31. Parts of a Basic AC Motor
32. Parts of a Basic DC Motor
33. Electric Motor Operation
34. Troubleshooting
35. Preventative Maintenance
36. Quiz: Electrical Basics and Introduction to Motors

## Lesson 10: Fluid Power Systems and Technical Print Reading Date

1. Fluid Power Systems
2. Overview
3. Closed vs. Open Loop Systems
4. Parts of a Fluid Power System
5. Pressure Readings
6. Measurements used with Fluid Power Systems
7. Laws of Fluid Power
8. Fluid Power Troubleshooting
9. Technical Print Reading
10. Quiz: Fluid Power Systems and Technical Print Reading
11. Module 2 Exam

## Lesson 11: Troubleshooting and Problem-Solving Techniques Date

1. Troubleshooting
2. Preparation
3. Observation
4. Reproduction
5. Categorize
6. Isolation
7. Resolution
8. Verification
9. Prevention
10. Problem-Solving Techniques
11. Problem Definition
12. Cause of the Problem
13. Deciding the Course of Action
14. Implement Solution
15. Verify Solution
16. Specific Areas of Technical Concern
17. Bearings
18. Pumps
19. Machines
20. Quiz: Troubleshooting and Problem Solving

## Lesson 12: Preventative Maintenance Date

1. Preventative Maintenance
2. Definition
3. Reality of Maintenance
4. Concepts
5. Conditions requiring a program
6. Functions of a Preventative Maintenance Program
7. Benefits
8. Long-Term Benefits
9. Planning, Scheduling, and Tracking PM
10. Effective and Ineffective PM Program
11. Common Styles of Program
12. PM System
13. Specific Elements
14. Calibration
15. Lubrication
16. Bearings
17. Clearance Checks
18. Cleaning
19. Quiz: Preventative Maintenance

## Lesson 13: Total Productive Maintenance and Quality Management Date

1. Total Productive Maintenance (TPM)
2. Definition
3. History
4. Five goals of TPM
5. Eight Pillars of Activity
6. Four Types of Maintenance Prevention
7. Introduction to Quality Management
8. Quality Improvement
9. Terms and definitions
10. Quality Trilogy
11. Quality Planning
12. Quality Control
13. Control of Nonconforming Products
14. Costs of Poor Quality
15. Quality Tools
16. Statistical Process Control
17. Quiz: Total Productive Maintenance and Quality

## Lesson 14: Measuring Process Quality and Quality Improvement Systems Date

1. Quality Measuring Process
2. Introduction to Statistical Process Control (SPC)
3. Measuring Equipment/Systems
4. Calibration
5. Mistake-Proofing Systems
6. Standard Operating Procedures
7. Quality Improvement and Assessment
8. When Quality Improvement Ends
9. Continuous Improvement
10. Quality Management System Audits
11. Root Cause Failure Analysis
12. Corrective and Preventative Action (CAPA) System
13. Total Quality Management Systems
14. Quality Awards
15. Benchmarking
16. Design of Experiments
17. Quiz: Measuring Process Quality and Quality Improvement Systems

## Lesson 15: Troubleshooting for Quality Date

1. Problem Solving and Troubleshooting for Quality Assurance (240 minutes)
2. Creative Problem Solving
3. Inspection
4. Quality Circle
5. Gathering Data
6. Five Whys
7. Fishbone or Cause and Effect Diagrams
8. Quiz: Troubleshooting for Quality
9. Module 3 Exam
10. Final Exam
11. Final Design Project Due.

# Part 4: Grading Information

## Graded Activities

### Module Exams

There will be three module exams, each worth 10% of the final grade.

### Final Exam

There will be a comprehensive final exam worth 25% of the grade.

### Final Design Project

There will be a final design project worth 25% of the final grade.

### Quizzes

Quizzes on assigned material will be designed for review and evaluation of learning and will be worth 10% of the grade.

### Homework

Doing work outside of class is critical to success. Homework is graded and will be worth 5% of the final grade.

### Class Participation

Class participation is important and will be worth 5% of the final grade.

## Grading Breakdown

Module Exams = 30%

Final Exam = 25%  
Final Design Project = 25%  
Quizzes = 10%

Homework = 5%  
Class Participation = 5%

## Grading Scale

A = 90-100   
B = 80-89   
C = 70-79   
D = 60-69   
F = 59 and below

## Late Work

Late work will not be accepted unless it is pre-approved by the instructor. All graded work will be posted in the college learning management system with 48 hours of due date.

# Part 5: College Policies and Resources

## Policies

### Attendance

### Academic Integrity

### Campus Civility

## Resources

### ****Counseling****

### ****Veterans****

### ****Students with Disabilities****

# About These Materials

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