ITT Technical Institute

IE1320T

Lean Manufacturing

Onsite and Online Course

SYLLABUS

Credit hours: 4.5

Contact/Instructional hours: 67 (41 Theory Hours, 26 Lab Hours)

Prerequisite(s) and/or Corequisite(s):

Prerequisite: IE1210 Manufacturing Processes or equivalent

Course Description:

This course explores terminology and benefits of lean manufacturing. Topics include simplification and standardization of workflow, managing capacity and eliminating waste in the production process.

COURSE SUMMARY

COURSE DESCRIPTION

This course explores terminology and benefits of lean manufacturing. Topics include simplification and standardization of workflow, managing capacity and eliminating waste in the production process.

MAJOR INSTRUCTIONAL AREAS

1. Process Improvement
2. Lean Six Sigma
3. Costs of Quality
4. Variation Reduction

COURSE LEARNING OBJECTIVES

By the end of this course, you should be able to:

1. Describe the evolution of Lean and Six Sigma.
2. Identify current issues and problems that affect manufacturing, service, and supply chain efficiency and suggest methods to resolve each of these issues and problems.
3. Identify methods for reducing or eliminating the seven wastes in manufacturing.
4. Differentiate between the applications of a push system and a pull system.
5. Create a value stream map to reduce costs, inventory, and lead times while improving quality and productivity.
6. Identify the elements of a 5S program and demonstrate its implementation.
7. Design a manufacturing mistake-proofing procedure.
8. Identify safety hazards in a given manufacturing environment using a failure modes and effects analysis and suggest methods for mitigation.
9. Describe process equipment variation by application of productive maintenance.
10. Explain how supply chain management helps to improve business operations.

COURSE OUTLINE

MODULE 1: LEAN METHODOLOGY

COURSE LEARNING OBJECTIVES COVERED

- Describe the evolution of Lean and Six Sigma.

TOPICS COVERED

- Origin of Lean
- Origin of Six Sigma
- Lean Six Sigma

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: Summers, D. C. S., Chapter 1.	No	1 hr
Reading: ITT Tech Virtual Library> Basic Search> • Duncan, E., & Ritter, R. (2014). Next frontiers for lean. *Mckinsey Quarterly, (2), 82-89.* • Goh, T. N. (2010). Six Triumphs and Six Tragedies of Six Sigma. *Quality Engineering*, *22*(4), 299–305.	No	2 hr
Lesson: Study the lesson for this module.	No	1.5 hr
Discussion: Participate in the discussion titled "Early Thinkers of the Lean Methodology."	Yes	1 hr
Short Answer: Submit the short answer titled "Lean Methodology."	Yes	2 hr
Project: Read and begin the project.	No	1 hr

Total Out-Of-Class Activities: 8.5 Hours

MODULE 2: PROCESS PERFORMANCE MEASURES AND DMAIC

COURSE LEARNING OBJECTIVES COVERED

- Identify current issues and problems that affect manufacturing, service, and supply chain efficiency and suggest methods to resolve each of these issues and problems.
- Identify methods for reducing or eliminating the seven wastes in manufacturing.

TOPICS COVERED

- Process Performance Measures
- Analysis of Gaps in Process Performance
- Reduction of Waste in Manufacturing Processes
- DMAIC Technique

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: Summers, D. C. S., Chapters 7 and 9.	No	2.5 hr
Reading: ITT Tech Virtual Library> Basic Search> • Atkinson, P. (2014). DMAIC: A methodology for Lean Six Sigma business transformation. *Management Services, 58(1), 12-17.* • Yu, K., & Ueng, R. (2012). Enhancing Teaching Effectiveness by Using the Six-Sigma DMAIC Model. *Assessment & Evaluation In Higher Education, 37(8), 949-961.* • Kaushik, P., & Khanduja, D. (2009). Application of Six Sigma DMAIC methodology in thermal power plants: A case study. *Total Quality Management & Business Excellence, 20(2), 197-207.*	No	4 hr
Lesson: Study the lesson for this module.	No	2 hr
Discussion: Participate in the discussion titled "Process Performance Measures."	Yes	N/A
Short Answer: Submit the short answer titled "DMAIC Technique."	Yes	2 hr
Lab: Complete the lab titled "Problem-Solving Tools."	Yes	N/A
Project: Continue work on Project Part 1.	No	4.5 hr

Total Out-Of-Class Activities: 15 Hours

MODULE 3: PROCESS MAPPING AND IMPROVEMENT

COURSE LEARNING OBJECTIVES COVERED

- Identify current issues and problems that affect manufacturing, service, and supply chain efficiency and suggest methods to resolve each of these issues and problems.
- Identify methods for reducing or eliminating the seven wastes in manufacturing.
- Differentiate between the applications of a push system and a pull system.
- Create a value stream map to reduce costs, inventory, and lead times while improving quality and productivity.

TOPICS COVERED

- Process Improvement
- Process Mapping
- Just-in-Time (JIT)
- Kanban
- Jidoka

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: Summers, D. C. S., Chapters 10 and 11.	No	2.5 hr
Reading: ITT Tech Virtual Library> Basic Search> • Amin, M., & Karim, M. A. (2013). A time-based quantitative approach for selecting lean strategies for manufacturing organizations. *International Journal of Production Research, 51*(4), 1146–1167. doi:10.1080/00207543.2012.693639 • Sun, D., Song, X., Zhao, M., & Zheng, L. (2012). Research on a JIT scheduling problem in parallel motorcycle assembly lines considering actual situations. *International Journal of Production Research, 50*(18), 4923–4936.	No	4 hr
Lesson: Study the lesson for this module.	No	2 hr
Short Answer: Submit the short answer titled “Just-in-Time and Kanban.”	Yes	3.5 hr
Lab: Complete the lab titled “Process Mapping.”	Yes	N/A
Project: Submit Project Part 1.	Yes	4 hr

Total Out-Of-Class Activities: 16 Hours

MODULE 4: LEAN FACILITY TOOLS

COURSE LEARNING OBJECTIVES COVERED

- Identify current issues and problems that affect manufacturing, service, and supply chain efficiency and suggest methods to resolve each of these issues and problems.
- Identify methods for reducing or eliminating the seven wastes in manufacturing.
- Identify the elements of a 5S program and demonstrate its implementation.
- Design a manufacturing mistake-proofing procedure.

TOPICS COVERED

- 5S
- Kaizen
- Error Proofing

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: Summers, D. C. S., Chapters 12 and 13.	No	2 hr
Reading: ITT Tech Virtual Library> Basic Search> Farris, J. A., Van Aken, E. M., Doolen, T. L., & Worley, J. (2008). Learning From Less Successful Kaizen Events: A Case Study. *Engineering Management Journal, 20(3), 10-20*	No	1.5 hr
Lesson: Study the lesson for this module.	No	2 hr
Short Answer 1: Submit the short answer titled "5S Methodology."	Yes	2.5 hr
Short Answer 2: Submit the short answer titled "Kaizen Methodology."	Yes	3.5 hr
Lab 1: Complete the lab titled "Application of Error Proofing."	Yes	N/A
Lab 2: Complete the lab titled "Mistake Proofing a Process."	Yes	N/A
Project: Begin work on Project Part 2.	No	4 hr

Total Out-Of-Class Activities: 15.5 Hours

MODULE 5: PRODUCTIVE MAINTENANCE AND FAILURE MODE

COURSE LEARNING OBJECTIVES COVERED

- Identify current issues and problems that affect manufacturing, service, and supply chain efficiency and suggest methods to resolve each of these issues and problems.
- Identify safety hazards in a given manufacturing environment using a failure modes and effects analysis and suggest methods for mitigation.
- Explain how supply chain management helps to improve business operations.

TOPICS COVERED

- Preventive Maintenance
- Predictive Maintenance
- Autonomous Maintenance
- Failure Mode and Effective Analysis (FMEA) Design

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: Summers, D. C. S., Chapters 15 and 22.	No	2 hr
Reading: ITT Tech Virtual Library> Basic Search> Digalwar, A. K., & Nayagam, P. V. (2014). Implementation of Total Productive Maintenance in Manufacturing Industries: A Literature-Based Metadata Analysis. *IUP Journal Of Operations Management, 13(1), 39-53*	No	2 hr
Lesson: Study the lesson for this module.	No	2 hr
Discussion: Participate in the discussion titled "Total Productive Maintenance."	Yes	N/A
Short Answer: Submit the short answer titled "Failure Mode and Effective Analysis."	Yes	2.5 hr
Lab: Complete the lab titled "Total Productivity Maintenance."	Yes	N/A
Final Exam: Prepare for the final exam.	No	5 hr
Project: Continue work on Project Part 2.	No	2 hr

Total Out-Of-Class Activities: 15.5 Hours

MODULE 6: SUPPLY CHAIN MANAGEMENT

COURSE LEARNING OBJECTIVES COVERED

- Describe the evolution of Lean and Six Sigma.

- Identify current issues and problems that affect manufacturing, service, and supply chain efficiency and suggest methods to resolve each of these issues and problems.
- Identify methods for reducing or eliminating the seven wastes in manufacturing.
- Differentiate between the applications of a push system and a pull system.
- Create a value stream map to reduce costs, inventory, and lead times while improving quality and productivity.
- Identify the elements of a 5S program and demonstrate its implementation.
- Design a manufacturing mistake-proofing procedure.
- Identify safety hazards in a given manufacturing environment using a failure modes and effects analysis and suggest methods for mitigation.
- Describe process equipment variation by application of productive maintenance.
- Explain how supply chain management helps to improve business operations.

TOPICS COVERED

- Supply Chain Process
- Supply Chain Management Benefits
- Supply Chain Management Elements
- Supply Chain Management Challenges

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: Summers, D. C. S., Chapter 16.	No	1.5 hr
Reading: ITT Tech Virtual Library> Basic Search> Foster, S., & Ogden, J. (2008). On differences in how operations and supply chain managers approach quality management. *International Journal Of Production Research, 46(24), 6945-6961.*	No	2 hr
Lesson: Study the lesson for this module.	No	2 hr
Project: Submit Project Part 2.	Yes	3 hr
Final Exam: Take the final exam.	Yes	N/A

Total Out-Of-Class Activities: 8.5 Hours

EVALUATION AND GRADING

EVALUATION CRITERIA

The graded assignments will be evaluated using the following weighted categories:

CATEGORY	WEIGHT
Short Answer	25%
Lab	25%
Project	20%
Discussion	10%
Final Exam	20%
TOTAL	100%

GRADE CONVERSION

The final grades will be calculated from the percentages earned in the course, as follows:

GRADE	PERCENTAGE
A (4.0)	90–100%
B+ (3.5)	85–89%
B (3.0)	80–84%
C+ (2.5)	75–79%
C (2.0)	70–74%
D+ (1.5)	65–69%
D (1.0	60–64%

)	
F (0.0)	<60%

LEARNING MATERIALS AND REFERENCES

REQUIRED RESOURCES

COMPLETE TEXTBOOK PACKAGE

- Summers, D. C. S. (2011). *Lean six sigma: Process improvement tools and techniques.* Upper Saddle River, NJ: Prentice Hall.

RECOMMENDED RESOURCES

- Books and Professional Journals
  - Ferguson, D. L. (2013). *Removing the barriers to efficient manufacturing: Real-world applications of lean productivity. Milwaukee, WI: ASQ Quality Press.*
  - Wincel, J. P., & Kull, T. J. (2013). *People, processes, and culture: Lean manufacturing in the real world. Milwaukee, WI: ASQ Quality Press.*
  - Womack, J. P., & Jones, D. T. (2003). *Lean thinking (2nd ed.). New York: Simon & Schuster.*
  - Womack, J. P., Jones, D. T., & Roos, D. (2007). *The machine that changed the world (2nd ed.). New York: Rawson Associates.*
- Professional Associations
  - American Society for Quality
    http://www.asq.org

The American Society for Quality has been educating and informing people about quality, Six Sigma, and lean worldwide since 1946. This website provides an incredible array of resources for anyone who is interested in improving the way their organization does business.

  - Society of Manufacturing Engineers
    http://www.sme.org

The Society of Manufacturing Engineers provides support material and education opportunities for individuals seeking to understand the complexities of modern manufacturing.

- ITT Tech Virtual Library (accessed via Student Portal | https://studentportal.itt-tech.edu)
  - Basic Search>

- Amin, M., & Karim, M. A. (2013). A time-based quantitative approach for selecting lean strategies for manufacturing organizations. *International Journal of Production Research, 51*(4), 1146–1167. doi:10.1080/00207543.2012.693639.
- Atkinson, P. (2014). DMAIC: A methodology for Lean Six Sigma business transformation. *Management Services, 58(1), 12-17.*
- Digalwar, A. K., & Nayagam, P. V. (2014). Implementation of Total Productive Maintenance in Manufacturing Industries: A Literature-Based Metadata Analysis. *IUP Journal Of Operations Management, 13(1), 39-53.*
- Duncan, E., & Ritter, R. (2014). Next frontiers for lean. *Mckinsey Quarterly, (2), 82-89.*
- Farris, J. A., Van Aken, E. M., Doolen, T. L., & Worley, J. (2008). Learning From Less Successful Kaizen Events: A Case Study. *Engineering Management Journal, 20(3), 10-20.*
- Foster, S., & Ogden, J. (2008). On differences in how operations and supply chain managers approach quality management. *International Journal of Production Research, 46(24), 6945-6961. doi:10.1080/00207540802010815.*
- Goh, T. N. (2010). Six Triumphs and Six Tragedies of Six Sigma. *Quality Engineering*, *22*(4), 299–305. doi:10.1080/08982112.2010.495102.
- Kaushik, P., & Khanduja, D. (2009). Application of Six Sigma DMAIC methodology in thermal power plants: A case study. *Total Quality Management & Business Excellence, 20(2), 197-207.*
- Sun, D., Song, X., Zhao, M., & Zheng, L. (2012). Research on a JIT scheduling problem in parallel motorcycle assembly lines considering actual situations. *International Journal of Production Research, 50*(18), 4923–4936. doi:10.1080/00207543.2011.616232.
- Yu, K., & Ueng, R. (2012). Enhancing Teaching Effectiveness by Using the Six-Sigma DMAIC Model. *Assessment & Evaluation in Higher Education, 37(8), 949-961.*

- Other References
  - Lean Enterprise Institute
    http://www.lean.org

The Lean Enterprise Institute is one of many educational websites that provide information about lean. Visitors to this site also can make connections with lean practitioners.

- The W. Edwards Deming Institute
  http://www.deming.org
  The W. Edwards Deming Institute is dedicated to educating individuals about process, product, and service improvement.

INSTRUCTIONAL METHODS AND TEACHING STRATEGIES

The curriculum employs a variety of instructional methods that support the course objectives while fostering higher cognitive skills. These methods are designed to encourage and engage you in the learning process in order to maximize learning opportunities. The instructional methods include but are not limited to lectures, collaborative learning options, use of technology, and hands-on activities.

To implement the above-mentioned instructional methods, this course uses several teaching strategies, such as research on lean initiatives taken by organizations and problem solving scenarios related to process improvement. Your progress will be regularly assessed through a variety of assessment tools including short answer, lab, project, discussion, and a final exam.

OUT-OF-CLASS WORK

For purposes of defining an academic credit hour for Title IV funding purposes, ITT Technical Institute considers a quarter credit hour to be the equivalent of: (a) at least 10 clock hours of classroom activities and at least 20 clock hours of outside preparation; (b) at least 20 clock hours of laboratory activities; or (c) at least 30 clock hours of externship, practicum or clinical activities. ITT Technical Institute utilizes a “time-based option” for establishing out-of-class activities which would equate to two hours of out-of-class activities for every one hour of classroom time. The procedure for determining credit hours for Title IV funding purposes is to divide the total number of classroom, laboratory, externship, practicum and clinical hours by the conversion ratios specified above. A clock hour is 50 minutes.

A credit hour is an artificial measurement of the amount of learning that can occur in a program course based on a specified amount of time spent on class activities and student preparation during the program course. In conformity with commonly accepted practice in higher education, ITT Technical Institute has institutionally established and determined that credit hours awarded for coursework in this program course (including out-of-class assignments and learning activities described in the “Course Outline” section of this syllabus) are in accordance with the time-based option for awarding academic credit described in the immediately preceding paragraph.

ACADEMIC INTEGRITY

All students must comply with the policies that regulate all forms of academic dishonesty or academic misconduct. For more information on the academic honesty policies, refer to the Student Handbook and the School Catalog.

INSTRUCTOR DETAILS

Instructor Name	
Office Hours	
Contact Details	

(End of Syllabus)