ITT Technical Institute

IE1310

Work Measurements

Onsite and Online Course

SYLLABUS

Credit hours: 4.5

Contact/Instructional hours: 56 (34 Theory Hours, 22 Lab Hours)

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

Prerequisites: IE1110 Introduction to Industrial Engineering Technology or equivalent, IE1210 Manufacturing Processes or equivalent

Course Description:

This course introduces principles and practices of work analysis and work measurement. Students will explore productivity improvement techniques, such as work simplification, motion economy, and time and motion studies. Topics include the design and standardization of work methods.

COURSE SUMMARY

COURSE DESCRIPTION

This course introduces principles and practices of work analysis and work measurement. Students will explore productivity improvement techniques, such as work simplification, motion economy, and time and motion studies. Topics include the design and standardization of work methods.

MAJOR INSTRUCTIONAL AREAS

1. Continuous Improvement Tools
2. Material Flow and Facilities Layout
3. Equipment Efficiency
4. Environmental Improvements
5. 5S Methodology

COURSE LEARNING OBJECTIVES

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

1. Improve material flow and work cell output using lean layout analysis.
2. Design a cellular layout-manufacturing cell to increase productivity, material flow, and efficiency.
3. Design a poka-yoke to improve overall equipment efficiency.
4. Identify value-added and non-value-added time in working cycles using motion study tools.
5. Describe the steps involved in creating and implementing a maintenance program.
6. Describe SMED methodology and list its benefits.
7. Describe the 5S implementation and list its benefits.
8. Discuss other work improvement methodologies related to efficient use of human resources, materials, visual controls, and technology.

COURSE OUTLINE

MODULE 1: MATERIAL FLOW AND CELLULAR LAYOUTS

COURSE LEARNING OBJECTIVES COVERED

- Improve material flow and work cell output using lean layout analysis.
- Design a cellular layout-manufacturing cell to increase productivity, material flow, and efficiency.

TOPICS COVERED

- Continuous Improvement Tools
- Just-in-Time
- Material Flow
- Facilities Layout
- Cellular Layouts

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: Santos, J., Wysk, R. Q. A., & Torres, J. M., Chapters 1, 2, and 3.	No	2 hr
Lesson: Study the lesson for this module.	No	1.5 hr
Discussion: Participate in the discussion titled "Layout Problems."	Yes	1 hr
Lab: Complete the lab titled "Productivity Issues."	Yes	2 hr
Quiz: Prepare for Quiz 1.	No	2 hr
Project: Read and begin the project.	No	1 hr

Total Out-Of-Class Activities: 9.5 hours

MODULE 2: QUALITY AND POKA-YOKE

COURSE LEARNING OBJECTIVES COVERED

- Design a poka-yoke to improve overall equipment efficiency.

TOPICS COVERED

- Inspection and Statistical Quality Control (SQC)
- SQC to Zero Defects
- Self-Check and Successive-Check Systems
- Source Inspection

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: Santos, J., Wysk, R. Q. A., & Torres, J. M., Chapter 4.	No	1 hr
Reading: ITT Tech Virtual Library> Basic Search> • Wasim, A., Shehab, E., Abdalla, H., Al-Ashaab, A., Sulowski, R., & Alam, R. (2013). An innovative cost modelling system to support lean product and process development. *International Journal Of Advanced Manufacturing Technology*, *65*(1-4), 165-181. • M., D., & D., S. (2009). The Poka-Yoke method as an improving quality tool of operations in the process. *Journal Of Achievements In Materials And Manufacturing Engineering, (1), 95-102.*	No	3 hr
Lesson: Study the lesson for this module.	No	2 hr
Discussion: Participate in the discussion titled "Quality Control."	Yes	N/A
Exercise: Submit the exercise titled "Everyday Poka-Yoke."	Yes	1 hr
Lab: Complete the lab titled "Error Proofing."	Yes	2 hr
Quiz: Take Quiz 1.	Yes	N/A
Project: Continue work on Project Part 1.	No	4 hr

Total Out-Of-Class Activities: 13 Hours

MODULE 3: PERFORMANCE AND MOTION STUDY

COURSE LEARNING OBJECTIVES COVERED

- Improve material flow and work cell output using lean layout analysis.
- Design a cellular layout-manufacturing cell to increase productivity, material flow, and efficiency.
- Design a poka-yoke to improve overall equipment efficiency.
- Identify value-added and non-value-added time in working cycles using motion study tools.

TOPICS COVERED

- Motion Study
- Value Analysis
- 5W2H and 5-Why
- Worker-Machine Diagram
- Machine-Worker Ratio

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: Santos, J., Wysk, R. Q. A., & Torres, J. M., Chapter 5.	No	2 hr
Reading: ITT Tech Virtual Library> Basic Search> Mr. Gurunath V, S., & Prof. V. S. Jadhav. (2012). "Ergonomic analysis of an assembly workstation to identify time consuming and fatigue causing factors using application of motion study." *International Journal Of Engineering And Technology, (4), 220-227.*	No	1 hr
Lesson: Study the lesson for this module.	No	2 hr
Discussion: Participate in the discussion titled "Fair Day's Work."	Yes	N/A
Exercise: Submit the exercise titled "Motion Study."	Yes	1.5 hr
Lab: Complete the lab titled "Man-Machine Diagram."	Yes	2 hr
Project: Submit Project Part 1.	Yes	4 hr
Quiz: Prepare for Quiz 2.	No	2 hr

Total Out-Of-Class Activities: 14.5 Hours

MODULE 4: AVAILABILITY, PERFORMANCE, AND MAINTENANCE

COURSE LEARNING OBJECTIVES COVERED

- Describe the steps involved in creating and implementing a maintenance program.

TOPICS COVERED

- Equipment Maintenance
- Types of Maintenance
- Maintenance Program Implementation
- Maintenance Tools

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: Santos, J., Wysk, R. Q. A., & Torres, J. M., Chapter 6.	No	3 hr
Reading: ITT Tech Virtual Library> Basic Search> • Koochaki, J., Bokhorst, J. A., Wortmann, H., & Klingenberg, W. (2013). The influence of condition-based maintenance on workforce planning and maintenance scheduling. *International Journal Of Production Research, 51(8), 2339-2351.* • Jae-Hak, L., & Dong Ho, P. (2007). Optimal Periodic Preventive Maintenance Schedules with Improvement Factors Depending On Number of Preventive Maintenances. *Asia-Pacific Journal Of Operational Research, 24(1), 111-124.*	No	3.5 hr
Lesson: Study the lesson for this module.	No	2 hr
Discussion: Participate in the discussion titled "Corrective and Preventive Maintenance."	Yes	N/A
Exercise: Submit the exercise titled "Performance and Maintenance."	Yes	1.5 hr
Lab: Complete the lab titled "Risk Priority Numbers."	Yes	3 hr
Quiz: Take Quiz 2.	Yes	N/A
Project: Begin work on Project Part 2.	No	4 hr

Total Out-Of-Class Activities: 17 Hours

MODULE 5: SMED AND 5S METHODOLOGY

COURSE LEARNING OBJECTIVES COVERED

- Describe SMED methodology and list its benefits.
- Describe the 5S implementation and list its benefits.

TOPICS COVERED

- SMED Methodology
- SMED Tools
- SME Effects and Benefits
- 5S Implementation Methodology
- 5S Tools
- 5S Benefits and Effects

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: Santos, J., Wysk, R. Q. A., & Torres, J. M., Chapters 7 and 8	No	4 hr
Reading: ITT Tech Virtual Library> Basic Search> • Cakmakci, M. (2009). Process improvement: performance analysis of the setup time reduction-SMED in the automobile industry. *International Journal Of Advanced Manufacturing Technology, 41(1/2), 168-179.* • Kobayashi, K., Fisher, R., & Gapp, R. (2008). Business improvement strategy or useful tool? Analysis of the application of the 5S concept in Japan, the UK and the US. *Total Quality Management & Business Excellence, 19(3), 245-262.*	No	3 hr
Lesson: Study the lesson for this module.	No	2 hr
Discussion: Participate in the discussion titled "Single-Minute Exchange of Die (SMED)."	Yes	N/A
Exercise: Submit the exercise titled "5S Implementation."	Yes	2 hr
Lab: Complete the lab titled "Standard Times."	Yes	2 hr
Project: Continue work on Project Part 2.	No	4 hr

Total Out-Of-Class Activities: 17 Hours

MODULE 6: OTHER IMPROVEMENT TOOLS

COURSE LEARNING OBJECTIVES COVERED

- Improve material flow and work cell output using lean layout analysis.
- Design a cellular layout-manufacturing cell to increase productivity, material flow, and efficiency.
- Design a poka-yoke to improve overall equipment efficiency.
- Identify value-added and non-value-added time in working cycles using motion study tools.
- Describe the steps involved in creating and implementing a maintenance program.
- Describe SMED methodology and list its benefits.
- Describe the 5S implementation and list its benefits.
- Discuss other work improvement methodologies related to efficient use of human resources, materials, visual controls, and technology.

TOPICS COVERED

- Human Resources
- Efficient Materials Use
- Visual Control
- Technology

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: Santos, J., Wysk, R. Q. A., & Torres, J. M., Chapter 9.	No	1.5 hr
Lesson: Study the lesson for this module.	No	1.5 hr
Lab: Complete the lab titled “Performance Rating.”	Yes	2 hr
Project: Submit Project Part 2.	Yes	4 hr

Total Out-Of-Class Activities: 9 Hours

EVALUATION AND GRADING

EVALUATION CRITERIA

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

CATEGORY	WEIGHT
Discussion	15%
Exercise	20%
Lab	25%
Quiz	20%
Project	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

Santos, J., Wysk, R. Q. A., & Torres, J. M. (2006). *Improving production with lean thinking.* Hoboken, NJ: Wiley.

RECOMMENDED RESOURCES

- Books and Professional Journals
  - Nichel, B., & Freivalds, A. (2003) *Methods, standards & work design (11th ed). New York, NY: McGraw-Hill.*
- Professional Associations
  - America Society for Quality (ASQ)
  - Institute of Industrial Engineers (IIE)
  - Society of Manufacturing Engineering (SME)
- ITT Tech Virtual Library (accessed via Student Portal | https://studentportal.itt-tech.edu)
  - Basic Search>
    - Clark, R. A. (2009). *Lean manufacturing principles for EMS success. SMT: Surface Mount Technology, 23(5), 12-13.*
    - Pattanaik, L. N., & Sharma, B. P. (2009). *Implementing lean manufacturing with cellular layout: a case study. International Journal Of Advanced Manufacturing Technology, 42(7/8), 772-779.*

Note: All links are subject to change without prior notice.

- Information Search

  Use the following keywords to search for additional online resources that may be used for supporting your work on the course assignments:

  - Job analysis
  - Toyota production systems
  - Lean concepts
  - Lean within the service sector
  - Motion and time study
  - Productivity improvement
  - Process improvement tools
  - Performance ratings
  - Work standards

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 critical thinking, online research, scenario-based analysis, and discussions. Your progress will be regularly assessed through a variety of assessment tools including discussions, exercises, labs, quizzes, and a project.

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)