

MILLERSVILLE UNIVERSITY
Department of Applied Engineering, Safety & Technology

AENG 494 TOTAL QUALITY MANAGEMENT
3 s.h.

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Rm 111, Osburn Hall

Spring 2023 Office Hours:
Monday 1-3pm
Tuesday 1-3pm
Wednesday 1-3pm

Course Meeting Location/Times:
Rm 309/303
Tuesday/Thursday 3:30-5:35pm

CATALOG DESCRIPTION

The history and development of the quality movements; factors influencing the total quality concept; the scope of modern quality systems; management organization and strategies for quality; engineering technology for quality; and statistical tools for measurement and monitoring of quality. Prerequisite: MATH 130 or permission of instructor.

<u>COURSE OBJECTIVES</u> <i>Upon successful course completion, students will be able to:</i>	<u>ASSESSMENTS</u> <i>Students' achievement of course objectives will be assessed based on the following*:</i>		<u>PROGRAM OUTCOMES</u> <i>Program learning competencies for the AET(M), ARET, & MFET programs:</i>
	LA	EX	
1. Explain the concept of "total quality" within an industrial enterprise.		x	A. Disciplinary Knowledge An ability to select and apply the knowledge, techniques, skills , and modern tools of the discipline to broadly defined applied engineering activities.
2. Compare the early approaches of quality control to the modern emphasis on total quality management.		x	
3. Identify the major changes and demands of the consumer, causing a need for total quality.		x	
4. Define a total quality system and explain the interrelationships of the functioning elements.		x	
5. Explain the economics of quality, relating the costs of quality with economic survival and growth.	x	x	
6. Compare the changing role of management, organization and quality responsibilities in the total quality system.		x	

7. List ways management can work to change attitudes toward quality commitments in the total system.		x	
8. Explain the change from a localized view of manufacturing to a global view.		x	
9. Explain the ramifications of the development of quality standards by the engineering department and how these help to define quality.		x	
10. List and explain quality techniques used by process control engineers to improve quality.	x	x	
11. Explain the major changes in the technology of equipment utilization, mechanization and control.		x	
12. Utilize statistical tools of quality that focus on process/product variations, frequency distributions, and probability.	x	x	
13. List some of the “special methods” quality personnel have developed to deal with quality problems not occurring on a regular basis.		x	
14. Design a process improvement and evaluate the effectiveness of the solution.	x	x	B. Design An ability to design systems, components, or processes for broadly defined applied engineering problems appropriate to program educational objectives.
15. Develop and analyze data through the use of statistical software.	x	x	

16. Develop and analyze variable and attribute control charts.	x	x	
17. Explain the importance of product reliability in the scope of total quality.	x	x	D. Oral Communication An ability to apply oral and graphical communication in both technical and non-technical environments.
18. Explain the basic techniques of production sampling in quality.	x	x	AND E. Written Communication An ability to apply written communication in both technical and non-technical environments.

* LA = Lab Experiment/Final Project; EX = Exam..

CONTENT OUTLINE

- I. Quality and Global Competitiveness
 - A. Relationship between quality and competitiveness
 - B. Competitiveness and the U.S. economy
 - C. Factors inhibiting competitiveness
 - D. Comparisons of international competitors
 - E. Technology and competitiveness
 - F. Global integration

- II. The Total Quality Approach to Quality Management
 - A. Quality and total quality defined
 - B. Key elements of quality
 - C. Total quality pioneers
 1. Deming
 2. Juran
 3. Crosby
 4. Others
 - D. Why total quality efforts succeed

- III. Strategic Management Planning and Execution
 - A. Strategic management defined
 - B. Components of strategic management
 - C. Strategic planning overview
 1. Performing a SWOT analysis
 2. Developing the vision
 3. Developing the mission
 4. Developing the guiding principles
 5. Developing the tactics

- IV. Quality Management and Ethics
 - A. Ethics defined
 - B. Trust and total quality
 - C. Values and total quality
 - D. Integrity and total quality
 - E. Responsibility and total quality
 - F. The manager's role in ethics
 - G. Organization's role in ethics
 - H. Handling ethical dilemmas
 - I. Ethics training
 - J. Models for making ethical decisions

- V. Partnering for Competitiveness
 - A. The partnering concept
 - B. Internal partnering
 - C. Partnering with suppliers

- D. Partnering with customers
 - E. Partnering with potential competitors
 - F. Global partnering
- VI. Quality Culture
- A. Understanding what a quality culture is
 - B. Activating a cultural change
 - C. Changing leaders to activate change
 - D. Laying the groundwork for a quality culture
 - E. Learning what a quality culture looks like
 - F. Countering resistance to cultural change
 - G. Establishing a quality culture
- VII. Customer Satisfaction and Retention
- A. Understanding who is a customer
 - B. Understanding customer-defined quality
 - C. Identifying external customer needs
 - D. Identifying internal customer needs
 - E. Recognizing the customer-driven organization
- VIII. Employee Empowerment
- A. Employee empowerment defined
 - B. Rationale for employee empowerment
 - C. Inhibitors for employee empowerment
 - D. Management's role
- IX. Leadership and Change
- A. Leadership defined
 - B. Motivation versus inspiration
 - C. Leadership styles
 - 1. Autocratic
 - 2. Democratic
 - 3. Participative
 - 4. Goal-oriented
 - 5. Situational
 - D. Total quality's leadership style
 - E. Leadership versus management
 - F. Resistance to change
 - 1. Management
 - 2. Employees
 - G. How to lead change
- X. Team Building and Teamwork
- A. Four-step approach to team building
 - B. Coaching, not bossing
 - C. Handling conflict in teams
 - D. Rewarding team performance
- XI. Education and Training
- A. Needs assessment
 - B. Workforce literacy
 - C. Improving learning
 - D. Managers as trainers
- XII. Overcoming Politics, Negativity and Conflict in the Workplace
- A. Internal politics defined
 - B. Power and politics
 - C. Organizational structure and politics
 - D. Impact of internal politics on quality
- XIII. ISO 9000 and Total Quality
- A. ISO 9000 defined
 - B. Comparative scope of ISO 9000 and total quality
 - C. Origin of ISO 9000
 - D. Management's motivation for ISO 9000

- XIV. Overview of Total Quality Tools
 - A. Pareto charts
 - B. Cause-and-effect diagrams
 - C. Check sheets
 - D. Histograms
 - E. Scatter diagrams
 - F. Run charts and control charts
 - G. Stratification
 - H. Gantt Charts
 - I. Process Flowcharts

- XV. Problem Solving and Decision Making
 - A. Solving and preventing problems
 - B. Utilizing the total quality tools
 - C. The decision-making process
 - D. Objective versus subjective decision making

- XVI. Statistical Process Control
 - A. SPC defined
 - B. Rationale for SPC
 - C. Control chart development
 - 1. Attribute charts (P, N, NP, U)
 - 2. Variable charts (X-bar R)
 - D. Process capability
 - E. Management's role in SPC
 - F. Implementation and deployment of SPC

- XVII. Advanced Methods/Tools for Quality Analysis
 - A. Analysis of Variance (ANOVA)
 - B. Design of Experiments (DOE)
 - C. Reliability & Repeatability (Gage R&R)

- XVIII. Continuous Improvement
 - A. Rationale for continuous improvement
 - B. Essential improvement activities
 - C. Structure for quality improvement
 - D. The scientific approach
 - E. The Kaizen approach
 - F. Goldratt's Theory of Constraints

- XIX. Benchmarking
 - A. Benchmarking defined
 - B. Rationale for benchmarking
 - C. Benchmarking versus reengineering
 - D. Prerequisites for benchmarking
 - E. Obstacles for successful benchmarking
 - F. Benchmarking resources
 - G. Perpetual benchmarking

TEXTS AND REQUIRED MATERIALS

- Goetsch, D. L., & Davis, S. B. (2016). *Quality management for organizational excellence* (9th ed.). Prentice Hall.
- Levine, D. M. (2006). *Six sigma statistics for green belts with Minitab and JMP*. Prentice Hall. ISBN: 0-13-701712-X.
- Wright, J. R., Jr. (2018, 2017, 2014, 2012, 2009, 2005). *Lecture notes (6th ed)*. AENG 494 Total Quality Management. Department of Applied Engineering, Safety & Technology, Millersville University of Pennsylvania Campus Bookstore. Millersville, Pennsylvania. ISBN: 9660202018794
- Wright, J. R., Jr. (2017, 2014, 2013). *Lab manual (3rd ed)*. AENG 494 Total Quality Management. Department of Applied Engineering, Safety & Technology, Millersville University of Pennsylvania Campus Bookstore. Millersville, Pennsylvania. ISBN: 9660202018800

COURSE REQUIREMENTS

Students are expected to participate in or complete the following activities:

1. Complete and submit all required laboratory experiments.
2. Satisfactorily complete all examinations.
3. Participate and contribute equally toward the completion of a final project and presentation.
4. Participate in all assigned clean-up activities at the end of each class session.
5. Regularly attend all lecture and laboratory sessions in their entirety. An attendance record will be maintained by the instructor during both lecture and laboratory segments. The attendance policy adopted by the Department of Applied Engineering, Safety & Technology will be in effect; unauthorized absences exceeding the number permitted in the departmental policy (3) will result in removal from the course, and a grade of "F" will be assigned. A copy of the departmental policy concerning attendance is included in this syllabus.

EVALUATION

Lab Activities (4 @ 5% each)	20%
Team Project Presentation Proposal (PowerPoint)	15%
Team Project Final Paper	25%
Exam I*	15%
Exam II*	15%
Cumulative Final**	10%
	100%

*Each student is allowed to use a single page (8.5"x11") hand-written reference sheet. This sheet must be unique and original to the student – it may not be copied or reduced (size) with a copier. Reference sheets will be inspected by the instructor prior to taking the exam.

**Students that pass the ATMAE Certified Technology Management (CTM) Exam will automatically earn an A in the class and will be excused from the Cumulative Final.

Scale:

93 - 100	A	80 – 82.9	B-	67 – 69.9	D+
90 – 92.9	A-	77 – 79.9	C+	63 – 66.9	D
87 – 89.9	B+	73 – 76.9	C	60 – 62.9	D-
83 – 86.9	B	70 – 72.9	C-	below 60	F

Should the end-of-semester mean score for the class fall below 75%, each student will receive a curve to fit the mean of 75%.

Grades will not be based upon criteria such as need, appearance, race, age, sex, or social status. Once determined, grades will not be changed except in the case of clerical errors that cause the student's true level of ability to be underestimated. Course grades may only be determined by the instructor of record.

NOTES

The instructor reserves the right to alter this syllabus as required.

Late work (less than 1 week) will be subject to a 25% reduction in the student's earned grade. All work submitted more than 1 week late will not be accepted and will result in a zero for the assignment.

Cell phones, PCs, and any type of data storage device or devices with cameras are **not** allowed for use on examinations.

STUDENTS WITH SPECIAL NEEDS

if you have a disability that requires accommodations under the Americans with Disabilities Act, please present your letter of accommodations and meet with me as soon as possible so that I can support your success in an informed manner. Accommodations cannot be granted retroactively. If you would like to know more about the Millersville University Office of Learning Services-please contact the office at 717-871-5554) ADA Program (Office of Learning Services) <https://www.millersville.edu/hr/ada/index.php>

OTHER MILLERSVILLE UNIVERSITY POLICIES AND LINKS

Academic Honesty Policy link:

<https://www.millersville.edu/about/administration/policies/pdf/academics/academic-policyacademic-honesty-and-dishonesty.pdf> ; for additional information please see the following:
<https://www.millersville.edu/cae/teaching-and-learning/academic-integrity.php>

Attendance Policy link: <https://www.millersville.edu/registrar/faculty/attendance-policy.php>

Inclusion Statement: <https://www.millersville.edu/dsj/inclusionstatement/>

Land Acknowledgement: <https://www.millersville.edu/dsj/land-acknowledgement/index.php>

Policy on Delays and Cancellations link: <https://www.millersville.edu/delays.php>

Preferred Name FAQs link: <https://www.millersville.edu/dsj/inclusionstatement/preferredname-faqs.php>

Privacy Rights under FERPA link: <https://www.millersville.edu/registrar/ferpaforstudents.php>

Student Conduct and Community Standards Handbook link:

<https://www.millersville.edu/studentconduct/files/studentcodeofconduct.pdf>

Title IX Reporting Requirements and the Faculty member: Millersville University is committed to maintaining a safe education environment for all students. In compliance with Title IX of the Education Amendments of 1972 and guidance from the Office for Civil Rights, the University requires faculty members to report incidents of sexual violence shared by students to the University's Title IX Coordinator. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. Faculty members are obligated to report sexual violence or any other abuse of a student who was, or is, a child (under 18 years of age) when the abuse allegedly occurred to the person. Information about Title IX, resources and reporting can be found at:
<https://www.millersville.edu/titleix/index.php>

ATTENDANCE

MILLERSVILLE UNIVERSITY ATTENDANCE POLICY

EFFECTIVE SPRING 2003

Approved by Faculty Senate 12/4/02; Administrative approval 1/10/03

The University supports departmental and faculty class attendance policies that are reflective of and consistent with University approved guidelines. Faculty will include their class attendance policy in their syllabi given to all students in their classes at the start of the semester.

University approved guidelines:

1. **Students are expected to attend all classes.** It is the student's responsibility to complete all course requirements even if a class is missed. If a student misses class for an officially excused reason, then he/she is entitled to make up the missed work but only at the convenience of the faculty member. Responsibility for materials presented in, assignments made for, and tests/quizzes given in regularly scheduled classes lies solely with the student.
2. **The University policy is that faculty will excuse absences for the following reasons:**
 - a. personal illness,
 - b. death or critical illness in the family,
 - c. participation in a university-sponsored activity,
 - d. jury duty,
 - e. military duties, or
 - f. religious holidays

3. **Faculty judge the validity of student absences from class within the University's approved guidelines and may require documentation for excused absences.** Faculty will evaluate any reason, other than those listed above, for a student missing class and determine whether the absence is justified. In these circumstances, a student may make up missed work at the discretion of the instructor.
4. **In the case of foreseeable absences, students are encouraged to notify the faculty member in advance.** A student who will miss class due to participation in an official University activity must notify the instructor well in advance of the activity to assure that the absence is excused.

Appeals:

As with any academic issue, students may exercise their right to appeal adverse attendance decisions. Please refer to the current undergraduate catalog for the complete Academic Appeal procedure.

DEPARTMENT OF APPLIED ENGINEERING, SAFETY & TECHNOLOGY ATTENDANCE POLICY
Adopted May 4, 1998

Students are expected to attend all scheduled classes in accordance with the above policy. To the extent that this does not happen, the following shall apply:

1. The limit of unauthorized absences depends upon the number of scheduled days per week as follows:
 - Fall and spring semesters
 - three per semester for a course scheduled three days per week
 - two per semester for a course scheduled one or two days per week
 - Winter and summer sessions
 - two per session
2. Each late arrival and early departure will count as one-half of an unauthorized absence.
3. Participation in outside-of-the-classroom educational activities and intercollegiate contests shall be communicated to the instructor prior to the absence. Failure to do so will convert these authorized absences to "unauthorized absences."
4. Students whose "unauthorized" absences exceed the policy stated in item #1 are liable to dismissal from the course with a grade of 'F' or 'Z.'

BIBLIOGRAPHY

- Besterfield, D. H. (2004). *Quality control* (7th ed.). Prentice Hall.
- Black, J. T. (1991). *The design of the factory with a future*. McGraw-Hill, Inc
- Chowdhury, S. (2001). *The power of six sigma*. Cahners Business Information, Inc.
- Defeo, J. (2010). *Juran's quality handbook: The complete guide to performance excellence* (6th ed.). McGraw-Hill.
- DeVor, R. E., Chang, T., & Sutherland, J. W. (2006). *Statistical quality design and control: Contemporary concepts and methods* (2nd ed.). Prentice Hall.
- Foster, S. T. (2009). *Managing quality* (4th ed.). Prentice Hall.
- Gitlow, H. S. & Levine, D. M. (2006). *Six sigma for green belts and champions: foundations, DMAIC, tools, cases, and certification*. Pearson Prentice Hall.
- Gelina, R. J. (1993). *Continuous quality improvement*. Ames, IA: Center for Continuous Quality Improvement.
- Kirk, R. E. (1994). *Experimental design: Procedures for the behavioral sciences* (3rd ed.). Brooks/Cole Publishing Company.
- Myers, F. E. (2001). *Motion and time study for lean manufacturing* (3rd ed.). Prentice Hall.
- Ott, R. L. (2010). *An introduction to statistical methods and data analysis* (6th ed.). Duxbury Press.
- Pries, H. (2009). *Six sigma for the new millennium: A CSSBB guidebook* (2nd ed.). American Society for Quality.
- Summers, C. S. (2007). *Six sigma: basic tools and techniques*. Prentice Hall.

AENG 494 Tentative Spring 2023 Schedule

Ver. A

Wright

Week of	T/R 3:30-5:35pm
1 1/16	Course Introduction The Total Quality Approach to Quality Management (Ch 1) Understanding Profound Knowledge Video (25 min) Quality and Global Competitiveness (Ch 2)
2 1/23	Problem Solving and Decision Making (Ch 16) The Prophet of Quality Video (55 min) Overview of Total Quality Tools (Ch 15)
3 1/30	Strategic Management: Planning and Execution for Competitive Advantage (Ch 3) Quality Management, Ethics, and Corporate Social Responsibility (Ch 4) Partnering and Strategic Alliances (Ch 5)
4 2/6	Quality Culture: Changing Hearts, Minds, and Attitudes (Ch 6) Developing Process Flowcharts & Gantt Charts Lecture <i>Lab 1, Process Flow Charts, Gantt Charts & Quality Tools</i>
5 2/13	Minitab (Histograms, Pareto Charts, & Fishbone Diagrams) <i>Lab 1, Process Flow Charts, Gantt Charts & Quality Tools</i> Customer Satisfaction, Retention, and Loyalty (Ch 7) The Red Bead Experiment and Life Video (25 min)
6 2/20	Tuesday: Lab 1 Due Optimizing and Controlling Processes Through Statistical Process Control (Ch 18)
7 2/27	Minitab (Variable Control Charts, Process Capability Analyses, & Attribute Control Charts) <i>Lab 2, SPC & Process Capability</i> Thursday: Lab 2 Due
8 3/6	No Class – Spring Break
9 3/13	Tuesday: EXM I (Chapters 1-7, 15, 16 & 18) Effective Communication (Ch 11) Cost Justification Lecture <i>Lab 3, Cost Justification take-home lab</i>
10 3/20	Tuesday: Lab 3 Due <i>Final Project Team Formation / Project Introduction</i> Assigned D2L, Employee Empowerment (Ch 8)
11 3/27	Final Project Proposal Development Class Worktime Assigned D2L, Leadership and Change (Ch 9) Assigned D2L, Team Building and Teamwork (Ch 10)
12 4/3	Final Project Proposal Presentations Due (Phase I & II) <i>Tuesday: Teams 1-3 only</i> <i>Thursday: Teams 4-6 only</i>
13 4/10	Final Project Class Worktime Assigned D2L, Education and Training (Ch 12) Assigned D2L, Overcoming Politics, Negativity, and Conflict in the Workplace (Ch 13)
14 4/17	Continual Improvement (Ch 19) Benchmarking (Ch 20) Hypothesis Testing (Six Sigma Ch 7) Assigned D2L, ISO 9000 and Total Quality: The Relationship (Ch 14) Assigned Read Chapter 21 JIT
15 4/24	Tuesday: Final Project Papers Due (Phase I, II, & III) Design of Experiments (Six Sigma Ch 8) <i>Lab 4, Hypothesis Testing</i> Thursday: EXM II (Chapters 8-14, 19-21, & SS7-8) Thursday: Lab 4 Due
Finals Week	Tuesday May 2, 10:15am-12:15pm: ATMAE CTM Exam Friday May 5, 12:30-2:30pm: Cumulative Final