LEARN TO USE SIX SIGMA TO IMPROVE EFFICIENCY, CUSTOMER SATISFACTION, AND YOUR BOTTOM LINE

presented by

Choose from Online or Classroom Options

- Transactional Service/Operations Green Belt and Black Belt Online
- Manufacturing Green Belt and Black Belt Online
- Academic Manufacturing Black Belt On Campus
- Design for Six Sigma Green Belt On Location
- Academic Lean Six Sigma Black Belt Graduate Certificate Online or On Campus

SIX SIGMA CERTIFICATION

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Register online today at InterPro.engin.umich.edu to begin taking your online class anytime, anyplace

ABOUT INTERPRO

Michigan Interdisciplinary and Professional Engineering (InterPro) develops and delivers programs and services that enable engineers, managers, and technical professionals to be more effective, productive, and competitive. InterPro extends and enhances the programs, capabilities, and relationships of the faculty and affiliates of the College of Engineering by offering graduate degree programs, distance learning, non-credit public short courses, professional certification programs, and conferences.

Visit our website at InterPro.engin.umich.edu for information on this and other Michigan Engineering programs including:
- Compliant Design
- Design & Control of Hybrid Vehicles
- Lean Healthcare Certification
- Lean Manufacturing Certification
- Lean Office Certification
- Lean Pharmaceutical Certification
- Lean Product Development Certification
- Lean Supply Chain & Warehouse Management Certification
- Systems Engineering Certification

Graduate degree programs currently offered include:
- Automotive Engineering
- Energy Systems Engineering
- Engineering Sustainable Systems
- Financial Engineering
- Global Automotive and Manufacturing Engineering
- Integrated Microsystems
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Online indicates programs with an online delivery option.

Graduate Certificates of Advanced Studies in Engineering (CASE) are also available in some of the programs.

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- Six Sigma for product development, manufacturing, and services
- Lean for manufacturing, healthcare and pharmaceuticals, logistics, office and product development

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**GREEN BELT CERTIFICATION**

Green Belt courses lay the foundation for performance in a Six Sigma environment. Much of this training is focused on how to apply Six Sigma tools and methodologies. Green Belts meet a variety of needs within an organization-wide Six Sigma strategy, often providing implementation support for sub-tasks within a high-impact project. Participants learn to apply Six Sigma tools and methodologies rather than acquiring a deep understanding of the statistical concepts behind them.

**BLACK BELT CERTIFICATION**

Organizations typically utilize Black Belts to address high-impact projects. Black Belt skills are frequently used by project team leaders. The focus is on developing a participant’s ability to effectively apply Six Sigma techniques to solve actual problems that affect corporate performance in quality, lead time, and cost in addition to customer-driven problem resolution. Attention is given to using these tools and techniques through extensive case studies derived from the practical experience of the instructor.

**HOW TO CHOOSE AN ONLINE SIX SIGMA PROGRAM**

Here are some things to keep in mind when evaluating online training:

- What is the reputation of the organization offering the training?
- How many past participants have been trained?
- Is the program focused only on manufacturing or does it include transactional service/operations examples?
- Is a detailed syllabus available?
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- Does the program prepare participants for the American Society for Quality (ASQ) exam?
- How user-friendly is the online interface?

**E-LEARNING BENEFITS**

- Self-paced learning
- Students can structure course timing around their schedule
- Time to review materials without slowing down classmates
- Lectures can be reviewed multiple times
- Active learning (thinking and doing during a lecture)
- Instructor interaction (students ask instructor questions via email)
- Instructors answer material-related questions within one day or less
- Video/audio files can be placed on corporate intranets

**TECHNICAL REQUIREMENTS**

High-speed internet access, Windows Media Player, or Flash Player 8.0 or later

Lean production is a necessary strategy for world leadership in manufacturing and Six Sigma has become a key component of manufacturing success. Acquiring skills in both equips students with comprehensive breadth and depth to streamline processes and improve the bottom line.

Online technology brings this program directly to work sites and homes by delivering regularly scheduled University of Michigan–Ann Arbor courses through distance education. Course notes and materials are distributed through our online learning portal MEOnline. Homework and other assignments are submitted either electronically or via email at the discretion of the course instructor.

**PROGRAM OBJECTIVES**

The program introduces the metrics required in manufacturing plants to accurately measure toward Lean or Six Sigma quality, covers traditional accounting systems to reward effectiveness, and culminates in a job-related project that applies the principles of lean production and Six Sigma.

**ADMISSION REQUIREMENTS**

- Bachelor of Science degree in Engineering (not engineering technology) from an Accreditation Board for Engineering and Technology (ABET) accredited institution or the international equivalent with at least two years of college engineering mathematics including probability and statistics.
- A completed Lean Six Sigma Application for Admission to the Certificate Program along with official transcripts from all universities attended.
- International students must take the Test of English as a Foreign Language (TOEFL) or the Michigan English Language Assessment Battery (MELAB).

**FACULTY**

This program relies upon established courses and faculty from various departments in the College of Engineering. Faculty from various engineering departments may supervise student practicum projects.

**TUITION**

For current information about tuition, see http://interpro.engin.umich.edu/igpinfo.htm?id=3&mode=online&itemid=278

**LEARN MORE**

Learn more at InterPro.engin.umich.edu, call (734) 647-7200, or send an email to MEonline@umich.edu.

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**ONLINE, ANYTIME, ANYPLACE**

Lecture slides, a dynamic table of contents, and streaming video are part of the user experience in online distance education from InterPro. All lectures, exercises, and course materials are online and students can interact with instructors.

**U-M Offers Other Lean Programs**

- Lean Office & Business Processes Certificate
- Lean Healthcare Certificate
- Lean Logistics & Supply Chain Certificate
- Lean Manufacturing Certificate
- Lean Product & Process Development Certificate

Learn more at InterPro.engin.umich.edu.

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**Graduate Academic Programs**

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- Masters in Energy Systems Engineering
- Masters in Financial Engineering
- Masters in Global Automotive and Manufacturing Engineering
- Masters in Integrated Microsystems
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- Masters in Pharmaceutical Engineering
- Lean Six Sigma Graduate Certificate

*Online or On Campus*

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**PROGRAM REQUIREMENTS**

- MFGE 426 Manufacturing Strategies (2 credits)
- MFGE 461 Quality Engineering Principles and Analysis (3 credits)
- A non-credit practicum including an eight-hour seminar examining the integration of Lean and Six Sigma plus the completion of a Six Sigma project reviewed by U-M faculty
- Successful completion of the online Black Belt Six Sigma examination

The two courses that are part of the Lean and Six Sigma Graduate Certificate can be applied to the Master of Engineering in Manufacturing if the student is accepted into the graduate program.
ONLINE SIX SIGMA
GREEN BELT CERTIFICATION

GARY HERRIN, Ph.D.,
Co-Director of the Six Sigma Program, is a Professor of Industrial and Operations Engineering at the University of Michigan. An internationally recognized consultant to 40+ major corporations, he has taught the elements of this course for 30 years at U-M. Dr. Herrin’s teaching and research have focused on statistical quality control and design and analysis of experiments. He received his BS degree in Engineering from Purdue University, and his MS of Science in Engineering and Ph.D. in Industrial and Operations Engineering from the University of Michigan.

PAT HAMMETT, Ph.D.,
Co-Director of the Six Sigma program, teaches courses in the Industrial and Operations Engineering Department. He also serves as Manager of the Manufacturing Systems Group with the AAD division of the University of Michigan’s Transportation Research Institute. He received his BS degree in Engineering from Ohio State University.

This course provides quality analysis skills to systematically improve new products and services as well as continuously improve existing key design business processes. It is built around design business process improvement and product and service optimization and robustness. It is offered in person and can be presented at a location of your choice or in Ann Arbor, Michigan.

PROGRAM MODULES
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3. Project Selection, Scoping and Project Charters
4. Voice of the Customer Analysis
5. Quality Function Deployment—Requirements Flow Down
6. Design Concept Selection (Pugh Analysis)
7. Design FMEA Analysis
8. Design Scorecards and Target Values
9. Mapping Techniques
10. Current State Analysis
11. Current State Metrics
12. Measurement System Analysis
13. Qualitative Process Analysis (P-Diagram)
14. Check Sheets, Pareto Analysis, and Stratification
15. Scatter plots, Regression, and Correlation
16. Introduction to Design Robustness and Experimentation
17. Single Factor Experiments
18. Two Factor Experiments/Interactions
19. Parameter Design and ffik DOE
20. Tolerance Concepts and Allocation Methods
21. Tolerance Stack-Up Analysis and Simulation
22. Improvement Strategies
23. Design Mistake Proofing
24. Design Verification and Validation Analysis
25. Control Strategies
26. DFSS Project Case Study Examples

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ONLINE SIX SIGMA PROGRAM CO-DIRECTORS

PROGRAM MODULES

TRANSACTIONAL
applies Six Sigma tools in a non-manufacturing context, showing how nearly all systems can benefit by reducing variation and improving process flow. Typical outcomes can include improving customer satisfaction scores, reducing internal processing time, and reducing service costs.

MANUFACTURING
uses cases from the manufacturing industry to illustrate how to improve quality, cost, and delivery by understanding and applying Six Sigma principles.

COURSE OVERVIEW
Both courses are available online for convenient “anytime, anyplace” online learning. Participants are expected to complete the 40-hour course and submit a project report within 120 days of starting. The course consists of 22 modules with exercises, providing a strong foundation that focuses on how to apply Six Sigma tools and methodologies.

The manufacturing version is available in nine languages. Take the course in Dutch, English, French, German, Italian, Japanese, Mandarin, Spanish, and Swedish.

Professional certification CEUs/CPEs
Upon successful completion, participants receive four Continuing Education Units and 48 Continuing Professional Education Credits.

$2,300 covers either program including a copy of QE Tools statistical analysis software. QE Tools is a highly functional user-friendly Excel-based add-in tool designed for Six Sigma Green Belts. Students will use QE tools for a Six Sigma project.
ONLINE AND ON CAMPUS SIX SIGMA BLACK BELT CERTIFICATION

ONLINE BLACK BELT CERTIFICATION (NO ACADEMIC CREDIT)
Participants like this option due to the flexibility of the e-learning format. Students are expected to complete the lectures and exercises within five months from their start date. Most participants spend 140–160 hours viewing lectures and completing exercises. The industry-focused project is due within six months following the completion of the modules. Overall, the program is expected to be completed within one year from the start date. Average program completion time is eight months.

2009 Program Pricing
- $5,600 without Minitab® statistical software
- $6,400 with Minitab® included

ON CAMPUS OR ONLINE 3-CREDIT ACADEMIC COURSE PLUS BLACK BELT MANUFACTURING CERTIFICATION
Students must be admitted to the College of Engineering to register for MFG 461: Quality Engineering Principles & Analysis, a three-credit course. Unlike the no academic credit option, students are on a timetable to submit homework, take exams and quizzes, and complete projects. For more information about admission, the academic calendar, and other topics, email MElonline@umich.edu or call (734) 647-7200.

Cost
Online or on campus tuition (in-state or out-of-state) plus $2,000 certification fee
For more information about tuition, email MElonline@umich.edu or call (734) 647-7200.

CERTIFICATION PROGRAM MODULES
1. Course Introduction—Six Sigma Overview
2. DMAIC Problem Solving Process
3. Minitab® Tutorial
4. Measuring the Current State of the Process (DPM, DPMO, Yield)
5. Basic Quality Tools
6. Problem Solving Session
7. Assessing Process Stability—Variable Control Charts
8. Statistical Process Control—Attributes Charts/Special
9. Problem Solving Session
11. Process Capability—Non-normal Distributions
12. Problem Solving Session
13. Two Variable Analysis—Correlation Analysis
14. Two Group Hypothesis Tests (F-tests, t-tests)
15. Problem Solving Session
16. Attribute Response (proportions/yield analysis)
17. One-Factor ANOVA—Robust Operating Windows
18. Problem Solving Session
21. Problem Solving Session
22. Multiple Regression/Stepwise Regression
23. DOE—Principles of Design of Experiments
24. Problem Solving Session
25. DOE—2k Factorial, General Linear Model
26. DOE—Full Factorial Designs—Interactions
27. Problem Solving Session
28. DOE—Taguchi Methods
29. Design for Six Sigma Concepts
30. Problem Solving Session
31. Failure Mode and Effects Analysis
32. Design for Reliability
33. Product Design Verification Analysis
34. Problem Solving Session
35. Tolerance Analysis
36. Control Systems (ISO 9000, MBNQA, APQP)
37. Problem Solving Session
38. Six Sigma Application Examples/Summary

Note: Problem-solving tools and examples vary by course.

PROFESSIONAL CERTIFICATION REQUIREMENTS
- Complete all Black Belt course modules, all test exercises, and required case assignment.
- Achieve >80 percent cumulative average from online exercises (multiple choice questions and short answers from solving case studies).
- Complete a Black Belt project using DMAIC steps that is summarized in a five to eight page report. The project requires a letter of approval supporting the proposal from an industry sponsor and approval by a U-M faculty member, completion according to specified guidelines, preparation of the report, and a letter of acceptance from the industry sponsor supervisor attesting to the impact of the project.
- Final certification is granted based on passing the final certification exam (50 questions online) with >80 percent and successful completion of the project.
- Continuing Professional Education (CPE) credits are earned. Participants can earn 132 credits toward their chosen certification program. Necessary documentation provided on request.

PREREQUISITES
Participants should have working knowledge of:
- Descriptive statistics (mean, std. deviation, etc.)
- Basic graphical analysis (scatter plot, histogram, pareto)
- Basic linear regression/correlation (fitting a line)
- Basic probability distribution fitting (e.g., normal)
- Basic Microsoft Excel (and/or statistical software) skills
- All Black Belt participants are given online entry into the UM Green Belt course for the purpose of reviewing lectures presented at the basic level
The Black Belt courses build on the procedures and statistical tools for the measurement, analysis, improvement, and control of processes taught in the foundational Green Belt-level courses. The program focuses on common transactional measures, such as reducing internal processing time, improving customer satisfaction scores, and reducing service costs. Multiple case studies are used. Participants who develop their mindset and methodology to the Black Belt skill level will be equipped to bring valuable skills to the role of project or team leader. Transactional/Service and Manufacturing Black Belts are both available as an online non-academic credit course. The Manufacturing Black Belt is also available as a 3-credit academic course online or on campus at the University of Michigan.

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3. Six Sigma DMAIC Problem Solving Model
4. Process Mapping
5. Voice of the Customer—Collecting Data
6. MEASURE: Current State of a Process (Metrics: Yield, DPM, DPMO)
7. Creating Check Sheets
8. Pareto Analysis
9. ANALYZE: Qualitative Process Analysis (5 Ms, P-Diagram)
10. Cause-and-Effect Diagram
11. Descriptive Statistics
12. Stratification Analysis
13. Exploring Data Patterns: Frequency, Histogram
14. Measurement Systems Analysis
15. Process Capability Analysis
16. Two Variable Analysis: Scatter Plot/Regression
17. Correlation Analysis
18. Customer Survey Analysis
19. Statistical Process Control Overview
20. Throughput Analysis
21. Improve and Control Phase
22. Applying Six Sigma Methodology—Case Study

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Online or On Campus

Technical Requirements

Graduate Academic Programs

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Learning Management System
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- Lean Healthcare Certification
- Lean Manufacturing Certification
- Lean Office Certification
- Lean Pharmaceutical Certification
- Lean Product Development Certification
- Lean Supply Chain & Warehouse Management Certification
- Systems Engineering Certification

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ABOUT INTERPRO

Graduate degree programs currently offered include:
- Automotive Engineering
- Energy Systems Engineering
- Engineering Sustainable Systems
- Financial Engineering
- Global Automotive and Manufacturing Engineering
- Integrated Microsystems
- Manufacturing Engineering
- Pharmaceutical Engineering
- Robotics and Autonomous Vehicles

Indicates programs with an online delivery option.

Graduate Certificates of Advanced Studies in Engineering (CASE) are also available in some of the programs.

Professional development short courses and certification programs include:
- Six Sigma for product development, manufacturing, and services
- Lean for manufacturing, healthcare and pharmaceuticals, logistics, office and product development

Visit our website at InterPro.engin.umich.edu for information on this and other Michigan Engineering programs including:
- Compliant Design
- Design & Control of Hybrid Vehicles
- Lean Healthcare Certification
- Lean Manufacturing Certification
- Lean Office Certification
- Lean Pharmaceutical Certification
- Lean Product Development Certification
- Lean Supply Chain & Warehouse Management Certification
- Systems Engineering Certification

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