

University of Kentucky

ME/MFS 503-201/401: Lean Manufacturing Principles & Practices

Spring 2019

Course Description:

This course will introduce students to the fundamentals concepts of production improvement utilizing lean manufacturing principles and practices. In addition to the lectures, web-based simulations/experiments/games will be used to help learn the application of the tools. An application project is also included where students will work to study a real-life manufacturing or service environment to assess the current state, identify improvement opportunities and develop countermeasures for implementation.

Prerequisites:

Engineering standing or with Instructor permission.

Instructor:

Dr. Fazleena Badurdeen

Room No. 414L, CRMS Building,

Phone: 323-3252, E-mail: badurdeen@uky.edu

Virtual Office:

<https://uky.zoom.us/j/733137534?pwd=MRQUSlZLqHuwIumekTziMw%3D%3D> (use password given)

Office hours: Available as needed (online through Zoom)

Student Learning Outcomes:

Upon completion of this course, the students should be able to

1. Understand and appreciate what is 'true lean'
2. Identify different types of wastes in manufacturing that do not add value from the customer's perspective
3. Understand the importance of culture and problem solving in lean transformations
4. Understand the concept of flow and learn how to implement a pull production system
5. Apply various tools such as 5S, visual management, setup reduction, and standardized work that can be used to eliminate waste and achieve flow in lean manufacturing
6. Analyze processes for problems and implement countermeasures to solve them.

Required Material:

There is no required text book for this course. All students must have a webcam and microphone to participate in the virtual meetings. Access to a scanner may be required. The minimum technical requirements to be successful in an on-line course are available at: <http://www.uky.edu/elearning/technology/technicalrequirements>. Other useful material, including demonstration videos, are available at: <http://www.engr.uky.edu/mfs/online-student-orientation-materials/>.

Reference Texts (optional):

There is no formal textbook required for this course. Some additional reference texts that will help you understand the topics covered are:

- ï Ohno, T., "Toyota Production System: Beyond Large-Scale Production", Productivity Press, 1988.
- ï Shingo, S., "A Study of the Toyota Production System", Productivity Press, 1981.
- ï Hirano, Hiroyuki, "5 Pillars of the Visual Workplace: The Sourcebook for 5S Implementation", Productivity Press, 1990.
- ï Shingo. S., "Zero Quality Control, Source Inspection and the Poka-Yoke System", Productivity Press, 1986
- ï Liker, J.K., "The Toyota Way", McGraw Hill, 2004.
- ï Liker, J.K. and Hoseus, M., "Toyota Culture: The Heart and Soul of the Toyota Way", McGraw Hill, 2007.
- ï The Productivity Press Development Team, "Pull Production for the Shopfloor", Productivity Press, 2002.
- ï Other relevant reading materials will be provided, as needed, during the course.

Grading:

The grade for the course will be based on the following assignments.

| | |
|--|-------|
| Quizzes | (15%) |
| Homework Assignments/Activity Reports* | (25%) |
| Attendance for Discussions | (5%) |
| Mid-term Exam* | (20%) |
| Final Project | (25%) |
| Final Exam* | (10%) |

**Additional questions/assignments will be given for students taking this course for graduate credit.*

Grading Scale:

Grades will be assigned as follows:

Undergraduate Students: A = 90%-100%; B = 80%-89%; C=70%-79%; D= 60%-69%;E= Below 60%

Graduate Students: A = 90%-100%; B = 80%-89%; C=70%-79%; E= Below 70%

Graduate Students: For those students taking the course for graduate credit, a differential in grade assignment compared to that for undergraduates is expected. The level of difficulty in the course project is also expected to be higher for graduate students. Also, graduate students must obtain a grade of 'C' or better to pass the course.

Quizzes: A short quiz will be given for each module based on the content covered.

Note that quizzes are due at 8:00 AM EST on the scheduled day.

Homework Assignments: Homework will be assigned at the end of each module. They will be due one week from the date assigned unless otherwise indicated. Homework must be submitted electronically through Canvas by 11:59 PM EST on the date it is due. All grades for the homework assignments will be posted on Canvas. All homework submitted on Canvas must be completed on white paper (lined notebook paper or white printer paper), scanned and submitted in pdf format. You can also use MS Word, MS PowerPoint, MS Excel, etc., to provide answers to the homework. If

so, all the documents must be converted into pdf format before being submitted through Canvas. Guidelines on how to convert documents to pdf is available at: <http://www.engr.uky.edu/mfs/online-student-orientation-materials/>.

See below for late homework policy.

Homework assignments will be due by midnight (11:59 PM EST) on the scheduled day.

Late homework will be considered on a case by case basis under special circumstances. Such instances should be submitted to the instructor via email. **Late submissions without prior approval will not be accepted 3 days after the due date and for each day that the submission is late, 10% of the total points will be taken off (maximum 30%).**

Online Discussion Sessions: A weekly discussion session will be held to discuss the week's content and answer any questions related to homework. These will be held through Zoom. See below for how to connect to the Zoom meetings.

There will be online discussion sessions (maximum 30 minutes) for the course every week, unless otherwise notified. **Online discussion sessions will be held every Monday at 5:30 PM EST.** Attendance will be taken at the discussion sessions. You are required to attend at least 7 (seven) of these discussion sessions (5% of the grade). Students are encouraged to review the lecture video and homework assignment prior to the discussion session and be prepared with questions. The online discussion sessions are one platform to get clarification on homework related questions. You can also submit questions through the 'Discussion Board' in Canvas or, **by sending a Canvas message.** Read policy regarding attending and general recommended practice for online discussion sessions in the 'Netiquette for Online Meetings' page on Canvas under 'Introduction and Overview'.

Activity Reports: This course includes a number of virtual simulations to help you learn and understand various concepts taught in the course. These will be posted on Canvas under the relevant modules. You will be required to run these experiments/simulations, observe performance of the system and report your observations and assessment of the situation. Specific guidelines to be followed for each experiment/simulation and observations to be recorded will be provided. See below for late report submission policy. **Note: Activity Reports are due by 11:59 PM EST on the scheduled day.**

Final Project: Each student in the course will be completing the final project independently. To help you identify the scope for the final project, a separate set of assignments has been created (labelled 'Problem Definition'). The first of these is due 02/10, with several revised submissions to follow. The final report for the project will be due in two parts (to spread workload across semester): **Part I will be due 03/31 by 11:59 PM EST; Part-II will be due 04/22 by 11:59 PM EST.** A template for the final report preparation will be provided.

Format for Submission: All assignments and reports submitted must meet the following guidelines for full credit to be given:

1. Use standard 8 ½ by 11 paper (unless otherwise stated), lined or unlined. Do not use paper from a spiral bound notebook.
2. Handwritten material must be legible when scanned. Use a suitably dark pen or pencil, and do not submit a camera photo.

Exams: The exams (mid-term and final) will test the student's understanding of the intended learning outcomes for this course. Exams are closed-book; you may need a calculator to answer some questions.

The mid-term and final exam dates are included in the course outline and the grades for these exams will be posted in myUK by the deadline established in the Academic Calendar (<http://www.uky.edu/Registrar/AcademicCalendar.htm>).

Proctored exams will be administered on-campus on the given dates for those who are able to come on campus. If you are not able to come on campus, an external proctoring facility must be arranged by the student. In most instances such facilities will require a proctoring fee to be paid. If you intend to take the exams at an off-campus location, see the section on 'Guidelines for External Proctor Selection' for more details. Inform the instructor ahead of time to finalize arrangements or for any questions related to proctor selection. Students with an **external proctor** must identify the person and have the forms (see Canvas) completed **at least one week before the exam date**.

The use of cell phones, MP3 players, or any other electronic device (other than a calculator) during the exams will be considered cheating. Cell phone calculators may not be used during exams.

Attendance: The policy and grade for attendance in the synchronous online discussion sessions was provided above. A grade of zero will be given for all unexcused absences from exams. Make-ups will be given only in cases of excused absences with prior approval. Students anticipating an absence for a major religious holiday are responsible for notifying the instructor in writing of anticipated absences due to their observance of such holidays **no later than the last day in the semester to add a class**.

Student Interaction:

Online Meetings: Online discussion sessions will be held using Zoom. The Zoom meeting room for this course will be at <https://uky.zoom.us/j/733137534?pwd=MRQUSlZLqHuwlumekTziMw%3D%3D>. You will be able to login to the meeting using your LINKBLUE information. A video to help you understand how to connect to these meetings is posted on Canvas.

E-mail: UK email addresses will be used. Students must activate e-mail forwarding if they prefer another primary e-mail address.

Canvas Access: Canvas will be used to communicate course content, announcements, exam grades, etc. To access UK's Canvas go to www.uky.edu and click on LINK BLUE then Canvas.

Technical Support: Students experiencing difficulty with delivery of the course material should contact the instructor or the UK help desk. Links to UK help are available on the Canvas login page. For difficulties with Canvas or logins, contact the Teaching and Academic Support Center <http://www.uky.edu/ukit/atg/tasc>, or the Information Technology Customer Support Center at <https://www.uky.edu/ukit/help>, and inform the instructor.

Minimum Technical Requirements for Effective Online Learning: The minimum requirements are outlined in this page:

<http://www.uky.edu/elearning/technology/technicalrequirements>

Audio-conferencing:

There are several options for the audio connection – use the one indicated by the instructor

- a. Direct phone line (recommended if only person-to-person conversation)
- b. Web-audio within Zoom. You will be automatically muted when connecting to the meeting. Press 'Unmute' before you speak.

Tentative Course Outline:

| Week | Description | Discussion Session | Quiz | Assignments Due (unless otherwise listed differently) |
|---|--|--|-----------|---|
| | Introduction and Course Overview | | | |
| 1 | Introduction to Lean | 1/14/2019 | 1/19/2019 | 1/19/2019 |
| 2 | Value and Waste | 1/22/2019 (Problem definition) | 1/26/2019 | 1/26/2019 |
| 3 | Current State Value Stream Mapping | 1/28/2019 | 2/2/2019 | 2/2/2019 |
| 4 | 5S & Visual Management | 2/4/2019 | 2/9/2019 | 2/9/2019 (Update#1 of problem definition due) |
| 5 | Standardized Work | 2/11/2019 | 2/16/2019 | 2/16/2019 |
| 6 | Standardized Work (Contd.), | 2/18/2019 | 2/23/2019 | 2/23/2019 (Update#2 of problem definition due) |
| 7 | Flow Production | 2/25/2019 | 3/2/2019 | 3/2/2019 |
| 8 | Structured Problem Solving | Special mid-term Discussion Session 02/28/2018 | No Quiz | 3/18/2019 (Update#3 of problem definition due) |
| Mid-term Exam 03/04/2019 (@ 5:30 PM on-campus venue TBD) | | | | |
| Spring Break 03/11/2019 to 03/16/2019 | | | | |
| 9 | Structured Problem Solving (Contd.) & Project Discussion | 3/18/2019 | 3/23/2019 | 3/23/2019 |
| 10 | Building in Quality | 3/25/2019 | 3/30/2019 | 3/30/2019 (Final Project Report - Part I due) |
| 11 | Setup Reduction and SMED & Project Discussion | 4/1/2019 | 4/6/2019 | 4/6/2019 |
| 12 | Pull Production | 4/8/2019 | 4/13/2019 | 4/13/2019 |
| 13 | Pull Production | 4/15/2019 | 4/20/2019 | 4/20/2019 |

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|--|-----------------------------------|-----------|---------|---|
| 14 | Future State Value Stream Mapping | 4/22/2019 | No Quiz | 4/21/2019 (Final Project Report - Part II due) |
| <i>Final Examination 4/29/2019 Final Exam (@ 5:30 PM on-campus venue TBD)</i> | | | | |

Changes may be made to any part of this syllabus during any time in the semester. Students will be full participants in the discussion about those changes and the final decision will be made collectively.

Excused Absences: Students need to notify the professor of absences prior to class when possible. S.R. 5.2.4.2 defines the following as acceptable reasons for excused absences: (a) serious illness, (b) illness or death of family member, (c) University-related trips, (d) major religious holidays, and (e) other circumstances found to fit "reasonable cause for nonattendance" by the professor.

Students anticipating an absence for a major religious holiday are responsible for ***notifying the instructor in writing of anticipated absences*** due to their observance of such holidays ***no later than the last day in the semester to add a class***. Information regarding dates of major religious holidays may be obtained through the religious liaison, Mr. Jake Karnes (859-257-2754).

Students are expected to withdraw from the class if more than 20% of the classes scheduled for the semester are missed (excused or unexcused) per university policy.

Verification of Absences: Students may be asked to verify their absences in order for them to be considered excused. Senate Rule 5.2.4.2 states that faculty have the right to request "appropriate verification" when students claim an excused absence because of illness or death in the family. Appropriate notification of absences due to university-related trips is required prior to the absence.

Late Submission Policy: Students who wish to submit a homework assignment/report later than the due date should obtain permission in advance from the instructor; otherwise, it will be treated as failure to submit the assignment as required. The number of additional days provided to submit the assignment/report will be decided by the instructor based on the reasoning for the delay.

Points will be deducted for every late submitted assignment/report if delayed further than the extended deadline. Five percent of the grade will be taken off for each day the submission is delayed from the newly stipulated deadline

Make-up Policy for Missed Work with an Excused Absence: Those students who have obtained prior permission from the instructor to have an excused absence will have one week to contact instructor regarding missed graded work.

Academic Integrity:

and plagiarism in all courses. The minimum penalty for a first offense is a zero on the assignment on which the offense occurred. If the offense is considered severe or the student has other academic offenses on their record, more serious penalties, up to suspension from the university may be imposed.

Plagiarism and cheating are serious breaches of academic conduct. Each student is advised to become familiar with the various forms of academic dishonesty as explained in the Code of Student Rights and Responsibilities. Complete information

can be found at the following website: <http://www.uky.edu/Ombud>. A plea of ignorance is not acceptable as a defense against the charge of academic dishonesty. It is important that you review this information as all ideas borrowed from others need to be properly credited.

Part II of *Student Rights and Responsibilities* (available online <http://www.uky.edu/StudentAffairs/Code/part2.html>) states that all academic work, written or otherwise, submitted by students to their instructors or other academic supervisors, is expected to be the result of their own thought, research, or self-expression. In cases where students feel unsure about the question of plagiarism involving their own work, they are obliged to consult their instructors on the matter before submission.

When students submit work purporting to be their own, but which in any way borrows ideas, organization, wording or anything else from another source without appropriate acknowledgement of the fact, the students are guilty of plagiarism. Plagiarism includes reproducing someone else's work, whether it be a published article, chapter of a book, a paper from a friend or some file, or something similar to this. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work, which a student submits as his/her own, whoever that other person may be.

Students may discuss assignments among themselves or with an instructor or tutor, but when the actual work is done, the student, and the student alone must do it. When a student's assignment involves research in outside sources of information, the student must carefully acknowledge exactly what, where and how he/she employed them. If the words of someone else are used, the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Making simple changes while leaving the organization, content and phraseology intact is plagiaristic. However, nothing in these Rules shall apply to those ideas, which are so general, and freely circulated as to be a part of the public domain (Section 6.3.1).

****Please note: Any assignment you turn in may be submitted to an electronic database to check for plagiarism.*

For information on Distance Learning Library Services go to <http://www.uky.edu/Libraries/DLLS>. You can also contact Carla Cantagallo, DL Librarian through phone (859-218-1240) or email (carla@uky.edu).

Accommodations due to disability:

If you have a documented disability that requires academic accommodations in this course, please make your request to the University Disability Resource Center. The Center will require current disability documentation. When accommodations are approved, the Center will provide you with a Letter of Accommodation which details the recommended accommodations. Contact the Disability Resource Center: David T. Beach, Director by phone 859-257-2754 or email address: dtbeac1@uky.edu.