

Course Outline

1. COURSE INFORMATION

Session Offered	FALL 2018	
Course Name	Lean Thinking	
Course Code	GENTECH 4LM3	
Date(s) and Time(s) of lectures	C01: Monday 6:30 pm to 9:30 pm (online)	
Program Name	One of the following: Civil Engineering Infrastructure Technology / Software Engineering Technology / Energy Engineering Technologies / Manufacturing Engineering Technology	
Calendar Description	Students will learn about and apply classical lean techniques well beyond the shop floor. Lean methods will enable students to deploy and adapt tools aimed at minimizing waste, removing non-value added activities, and pursuing incremental improvements across organizations.	
Instructor(s)	Dr. Louie D'Orazio, B.Sc.Eng., M.Sc.Eng., EMBA, MMP, Ph.D., P.Eng.	E-Mail: dorazio@mcmaster.ca or louie.dorazio@mohawkcollege.ca Phone: 905-575-1212 Ext 3650 Office Hours & Location: n/a

2. COURSE SPECIFICS

Course Description	<p>Students will be stepped through the philosophies of Lean Thinking based on the Toyota Production System; adopted globally. The philosophies will be reviewed through a series of structured modules as listed below through four major categorical deliverables.</p> <p><u>GENERAL</u></p> <ol style="list-style-type: none"> 1) Lean Thinking Approach 2) Lean & Green 3) Lean Design 4) Lean Six Sigma 5) 5S & Visual Controls 6) Cellular Manufacturing 7) Value Stream Mapping <p><u>LEAN BUSINESS</u></p> <ol style="list-style-type: none"> 8) Integrated Business Involvement 9) Lean ERP/Supply Change Management <p><u>PROBLEM SOLVING</u></p> <ol style="list-style-type: none"> 10) Poke yoke 11) Quick Setup/SMED 12) FMEA 13) Root Cause Analysis <p><u>SUSTAINABILITY</u></p> <ol style="list-style-type: none"> 14) Total Productive Maintenance 15) Reliability Centered Maintenance
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	<p>Assignments, based on specific chapters out of the required textbooks, will be required to be completed every two (2) weeks. These assignments are based on the philosophies and specific applications of LEAN systems.</p> <p>Breakout sessions (4) are based on specific “Advanced Quality Applications” geared towards “real-life” applications. These are supplements for Problem Solving philosophies for Lean Thinking.</p> <p>Assignment Due Every Two (2) Weeks as described in outline. No Mid-Term Final Exam (closed book) One (1) face-to-face material review One (1) face-to-face presentation practice Two (2) face-to-face presentation finals (report due) – refer to dates in this outline.</p>		
Instruction Type	Code	Type	Hours per term
	C	Classroom instruction	9
	L	Laboratory, workshop or fieldwork	30
	T	Tutorial	
	DE	Distance education	
	Total Hours		39
Resources	ISBN	Textbook Title & Edition	Author & Publisher
	ISBN: 978-1-56327-359-9	Mapping the Total Value Stream	Nash & Poling (CRC Press, 2008)
	Other Supplies	Source	
	Posted on A2L	Instructor’s notes/Examples; • Published Papers/Case Studies, Videos	
Prerequisite(s)	n/a		
Corequisite(s)	n/a		
Antirequisite(s)	GENTECH 4LT3		
Course Specific Policies	<p>It is expected that students read the material that is coming under discussion prior to class. Students are expected to attend and actively participate during class sessions offering insight, comment, reinforcement, contrary views, and underscoring examples. All homework assignments submitted for evaluation are completed by word processor software.</p> <p><u>Communication:</u> It is YOUR responsibility to check Avenue daily – everything you will need is there and any special announcements will be posted there. Set your home page to the news feed of this course.</p> <p>The professor will only respond to emails from students’ McMaster email accounts. Ensure that your Mac account is activated and has space to receive emails. The Professor will reply to emails only once, and if it returns as “undeliverable mail”, the Professor will not attempt any further replies. The Professor will not respond to emails asking questions to which the answer is readily available in the course outline or Avenue.</p> <p><u>Examinations:</u> There is no mid-term examination.</p>		

	<p>The cumulative final examination will be written during the scheduled examination period. The final exam format will include application-focused short answer questions and multiple questions related to case incident specific to the constraints presented in the case.</p> <p>Students must achieve a cumulative passing mark on the combined project/presentation and final exam assessment to pass the course. However, the student must achieve a minimum of 50%(pass) on each of the project/presentation and final exam components.</p> <p><u>Project/Presentation Details</u></p> <p>Case studies will be distributed to the specific groups. Each group will develop a solution based on Current and Future Value Stream Maps and, submit a format report and participate in a formal presentation (all must be involved).</p> <p>Details of report layout and presentation format is available on “Avenue”.</p> <p><u>Breakout Session Details</u></p> <p>The breakout sessions will deal specific with four (4) advanced quality tools utilized within the lean thinking philosophies. This is individual based and although not graded, is designed to increase the students’ in-depth knowledge on problem solving. Each student will be required to participate online for feedback during the breakout sessions. (where applicable as presentations, practice and final are mandatory)</p> <p><u>Group Selection</u></p> <p>The class will be divided into groups, specifically 4 per group. This can either be selected within the class participants themselves or selected by the professor. As outlined in this course outline, this must be achieved during the Week of September 23rd (Monday September 24th).</p> <p>It is the responsibility of the group participants to maintain communication with their team members.</p> <p>Reports are due on the last day of class and must be delivered via hard-copy and USB (Monday December 3rd).</p>
<p>Departmental Policies</p>	<p>Students must maintain a GPA of 3.5/12 to continue in the program.</p> <p>In order to achieve the required learning objectives, on average, B.Tech. Students can expect to do at least 3 hours of “out-of-class” work for every scheduled hour in class. “Out-of-class” work includes reading, research, assignments and preparation for tests and examinations.</p> <p>Where group work is indicated in the course outline, such collaborative work is mandatory.</p> <p>The use of cell phones, iPods, laptops and other personal electronic devices are prohibited from the classroom during the class time, unless the instructor makes an explicit exception.</p> <p>Announcements made in class or placed on Avenue are considered to have been communicated to all students including those individuals that are not in class.</p>

	Instructor has the right to submit work to software to identify plagiarism.	
3. SUB TOPIC(S)		
Week 1 (September 10 th)	<p>Lean Introduction (Innovative Manufacturing)</p> <ul style="list-style-type: none"> • Develop an understanding of the importance of LEAN SYSTEMS for all sectors • Integrate the Lean Thinking philosophies into current environmental concerns 	<p>Mini-videos:</p> <p>a) Course Introduction, b) Lean Thinking Approach, c) Lean & Green</p>
Week 2 (September 17 th)	<p>Lean Strategies - Optimizing the Manufacturing Environment through Lean Design and Six Sigma applications and following through with the Visual Factory principles.</p> <ul style="list-style-type: none"> • Develop an understanding for the available Six Sigma techniques and choose the right application for particular Lean applications. • Differentiate between traditional engineering design principles and Lead Design principles • Integrate 5S technologies into the current environment 	<p>Read CH01: The Big Picture</p> <p>Mini-videos:</p> <p>a) Lean Design, b) Lean Six Sigma, c) 5S & Visual Controls</p> <p>Breakout Session: Mini Workshop</p>
Week 3 (September 24 th)	<p>Lean Strategies - Optimization of the system utilizing Cellular Manufacturing and Value Stream Mapping</p> <ul style="list-style-type: none"> • Develop a plan or approach to maximize the effects of Human Factors within the system (cell layouts) • Evaluate VA (value-added), NVA (non-value added) and R-NVA (required value added) activities 	<p>Read CH02: Identifying The Value Stream</p> <p>Mini-videos:</p> <p>a) Cellular Manufacturing, b) Value Stream Mapping</p> <p>Breakout Session: Mini Workshop</p> <p>Assignment #1 Due: Open at start of term and closes on Monday September 24th, 2018 at 5pm. Summary of Chapters 1 & 2</p>
Week 4 (October 1 st)	<p>Lean Strategies – Optimizing the environment through Integrated Business Involvement and Supply Chain Management</p> <ul style="list-style-type: none"> • Distinguish between “leaning” the Supply Chain and the traditional approach to maximizing the Supply Chain • Optimize the involvement of outside parties and stakeholders Integrated Business involvement without oversaturation of the Supply Chain 	<p>Read CH03: Collecting Basic Information About the Current State</p> <p>Read CH04: Documenting Manufacturing Process Flow</p> <p>Mini-videos:</p> <p>a) Integrated Business Involvement,</p>

		b) Supply Chain Management
	Mid-term Recess: Monday, Monday October 8 th to Sunday October 14 th	
Week 5 (October 8 th)	<p>Lean Strategies - Optimization utilizing Poke-Yoke and SMED principles</p> <ul style="list-style-type: none"> Distinguish between standard mistake-proofing and the Poke-Yoke methodologies Optimize flow-through utilizing Single Minute Exchange of Dies (SMED) versus traditional changeover procedures 	<p>Read CH07: Interpreting & Understanding Basic Product Flow</p> <p>Mini-videos: a) Poke-Yoke, b) Quick Setup & SMED</p> <p>Assignment #2 Due: Open at start of term and closes on Monday October 8th, 208 at 5pm. Summary of Chapters 3 & 4</p> <p>Establish Project Teams: (refer to details in course outline under Specific Policies)</p>
Week 6 (October 15 th)	<p>Lean Strategies - Optimization utilizing Failure Mode Effects Analysis (FMEA)</p> <ul style="list-style-type: none"> Integrate FMEA (Failure Mode Effect Analysis) and RCA (Root Cause Analysis) into existing processes Distinguish the difference between traditional failure analysis and Lean Thinking methodologies 	<p>Read CH08: Utilizing Data In Manufacturing</p> <p>Mini-videos: a) Failure Mode Effects Analysis (FMEA) , b) Root Cause Analysis (RCA)</p> <p>Breakout Session: Mini Workshop</p>
Week 7 (October 22 nd)	<p>Continuation of Week 6: Lean Strategies - Optimization utilizing Failure Mode Effects Analysis (FMEA)</p> <ul style="list-style-type: none"> Integrate FMEA (Failure Mode Effect Analysis) and RCA (Root Cause Analysis) into existing processes Distinguish the difference between traditional failure analysis and Lean Thinking methodologies 	<p>Breakout Session: Mini Workshop</p> <p>Assignment #3 Due: Open at start of term and closes on Monday October 22nd, 2018 at 5pm. Summary of Chapter 5 & 6</p>
Week 8 (October 29 th)	<p>Project Updates</p> <ul style="list-style-type: none"> Appraise all of the project updates in terms of Current Value Stream Mapping 	Work session online for groups on progress of the specific projects.

	<ul style="list-style-type: none"> • Make changes as noted to the Current Value Stream Mapping 	<p>This will include detailed discussion on each of the projects. All questions on past assignments will be discussed as well.</p> <p><u>Assignment #4 Due:</u> Open at start of term and closes on Monday October 29th, 2018 at 5pm. Summary of Chapter 7 & 8</p>
<p>Week 9 (November 5th)</p>	<p>Lean Strategies - Utilizing Total Productive Maintenance (TPM) and Reliability Centered Maintenance (RCM)</p> <ul style="list-style-type: none"> • Integrate TPM (Total Productive Maintenance) techniques into existing assets as to maximize operating times • Distinguish between the application of traditional maintenance methods and RCM (Reliability Centered Maintenance) into existing processes 	<p>Mini-videos:</p> <p>a) Total Productive Maintenance (TPM), b) Reliability Centered Maintenance (RCA)</p>
<p>Week 10 (November 12th)</p>	<p>Review of outstanding course material and finalizing group onsite work presentations and setup.</p>	<p>Breakout Groups</p> <p><u>Assignment #5 Due:</u> Open at start of term and closes on Monday November 12th, 2018 at 5pm. Summary of Chapter 10 & 12</p> <p>In Class Face to Face Discussion (Each TEAM will be able to deliver a "Practice" presentation prior to the final presentation)</p> <p>Mandatory on campus (Monday November 12th from 6:30 pm – 9:30 pm)</p>
<p>Week 11 (November 19th)</p>	<p>Review of outstanding course material and finalizing group onsite work presentations and setup.</p>	<p>In Class Face to Face Discussion (Each TEAM will be able to deliver a "Practice" presentation prior to the final presentation)</p>

		Mandatory on campus (Monday November 19 th from 6:30 pm – 9:30 pm)
Week 12 (November 26 th)	<p>Lean Strategy Presentations (Group Presentations)</p> <ul style="list-style-type: none"> • Create The Value Stream • Assess the waste • Construct The Value Stream Maps (before and after) • Conclude and argue all of the constraints 	<p>Face to Face Assessment: Mandatory on campus (Monday November 26th from 6:30 pm – 9:30 pm)</p> <p>Assignment #6 Due: Open at start of term and closes on Monday November 26th, 2018 at 5pm. Summary of Chapter 15 & 16</p>
Week 13 (December 3 rd)	<p>Lean Strategy Presentations (Group Presentations)</p> <ul style="list-style-type: none"> • Create The Value Stream • Assess the waste • Construct The Value Stream Maps (before and after) • Conclude and argue all of the constraints 	<p>Face to Face Assessment: Mandatory on campus (Monday December 3rd from 6:30 pm – 9:30 pm)</p> <p>All Project Reports Due: (Monday December 3rd at 9:30 pm)</p>
<p>Classes end: Wednesday December 5th, 2018 Final examination period: Friday December 7th to Thursday December 20th, 2018 All examinations MUST be written during the scheduled examination period.</p>		
List of experiments		
Lab 1		
Lab 2		
Lab 3		
Lab 4		
Mid-term Recess: October 8 th to Sunday October 14 th , 2018		
Lab 5		
Lab 6		
Lab 7		
Lab 8		
Lab 9		
Lab 10		
Lab 11		
Lab 12		
<p>Note that this structure represents a plan and is subject to adjustment term by term. The instructor and the University reserve the right to modify elements of the course during the term. The University may change the dates and deadlines for any or all courses in extreme circumstances. If either</p>		

type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes.

4. ASSESSMENT OF LEARNING *including dates*	Weight
Assignments (<i>These are the summaries for the final examination. Although it is not an open-book exam, these assignments will be utilized as the aid for the final examination</i>)	10%
Project (<i>30% for report, 10% for presentation</i>) – Details listed in “avenue to learn”.	40%
Final examination (tests cumulative knowledge) (<i>Only Assignments are Allowed</i>)	50%
TOTAL	100%
Percentage grades will be converted to letter grades and grade points per the University calendar.	

5. LEARNING OUTCOMES

1. Integrate the basic lean strategies and demonstrate how they incorporate to manufacturing/service processes, including;
 - Types of waste
 - 5S & Visual Control
 - Kaizen, Mistake Proofing
 - J.I.T. (Just In Time)
 - KANBAN
2. Prove the Value Stream Mapping Technique in the evaluation of the flow of materials and information currently required to bring a product or service to a consumer; i.e. create a current state process and design a process map of the future state.
3. Prioritize improvement actions that address non-value-added activity and waste.
4. Evaluate various business processes utilizing Failure Modes & Effects Analysis (FMEA) and other established problem solving methods.
5. Demonstrate Presentation Skills, and Report Writing Skills. (through presentation and report details. Presentation and Report Specifics are available on Avenue.)

6. POLICIES

Anti-Discrimination

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible.

http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&Response.pdf

Academic Integrity

You are required to exhibit honestly and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, located at: <http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf>.

The following illustrates only three forms of academic dishonesty:

1. Plagiarism. E.g. the submission of work that is not own or for which other credit has been obtained
2. Improper collaboration in group work
3. Copying or using unauthorized aids in tests and examinations.

Requests for Relief for Missed Academic Term Work (Assignments, Mid-Terms, etc.)

The McMaster Student Absence Form is an on-line self-reporting tool for Undergraduate Students to report absences for:

- 1) Relief for missed academic work worth less than 25% of the final grade resulting from medical or personal situations lasting up to three calendar days:
 - Students may submit a maximum of one academic work missed request per term. It is the responsibility of the student to follow up with instructors immediately (within the 3 day period that is specified in the MSAF) regarding the nature of the accommodation. All work due in that time period however can be covered by one MSAF.
 - MSAF cannot be used to meet religious obligation or celebration of an important religious holiday, for that has already been completed or attempted or to apply for relief for any final examination or its equivalent.
- 2) For medical or personal situations lasting more than three calendar days, and/or for missed academic work worth 25% or more of the final grade, and/or for any request for relief in a term where the MSAF has not been used previously in that term:
 - Students must visit their Associate Dean's Office (Faculty Office) and provide supporting documentation.

E-Learning Policy

Consistent with the Bachelor of Technology's policy to utilize e-learning as a complement to traditional classroom instruction, students are expected to obtain appropriate passwords and accounts to access Avenue To Learn for this course. Materials will be posted by class for student download. It is expected that students will avail themselves of these materials prior to class. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail account, and program affiliation may become apparent to all other students in the course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about this disclosure please discuss this with the course instructor. Avenue can be accessed via <http://avenue.mcmaster.ca>.

Communications

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their @mcmaster.ca alias.
- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @mcmaster.ca alias.
- Check the McMaster/Avenue email and course websites on a regular basis during the term.

Turnitin (Optional)

This course will be using a web-based service (Turnitin.com) to reveal plagiarism. Students submit their assignment/work electronically to Turnitin.com where it is checked against the internet, published works and Turnitin's database for similar or identical work. If Turnitin finds similar or identical work that has not been properly cited, a report is sent to the instructor showing the student's work and the original source. The instructor reviews what Turnitin has found and then determines if he/she thinks there is a problem with the work. Students who do not wish to submit their work to Turnitin.com must still submit a copy to the instructor. No penalty will be assigned to a student who does not submit work to Turnitin.com. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, etc.). To see the Turnitin.com Policy, please go to <http://www.mcmaster.ca/academicintegrity/turnitin/students/>

Protection of Privacy Act (FIPPA)

The Freedom of Information and Protection of Privacy Act (FIPPA) applies to universities. Instructors should take care to protect student names, student numbers, grades and all other personal information at all times. For example, the submission and return of assignments and posting of grades must be done in a manner that ensures confidentiality.

<http://www.mcmaster.ca/univsec/fippa/fippa.cfm>

Academic Accommodation of Students with Disabilities Policy

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca. For further information consult McMaster's policy for Academic Accommodation of Students with Disabilities

<http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicAccommodation-StudentsWithDisabilities.pdf>

Students must forward a copy of the SAS accommodation to the instructor of each course and to the Program Administrator of the B.Tech. Program immediately upon receipt. If a student with a disability chooses NOT to take advantage of a SAS accommodation and chooses to sit for a regular exam, a petition for relief may not be filed after the examination is complete. <http://sas.mcmaster.ca>

Student Code of Conduct

The Student Code of Conduct (SCC) exists to promote the safety and security of all the students in the McMaster community and to encourage respect for others, their property and the laws of the land. McMaster University is a community which values mutual respect for the rights, responsibilities, dignity and well-being of others. The purpose of the Student Code of Conduct is to outline accepted standards of behavior that are harmonious with the goals and the well-being of the University community, and to define the procedures to be followed when students fail to meet the accepted standards of behavior. All students have the responsibility to familiarize themselves with the University regulations and the conduct expected of them while studying at McMaster University.

http://studentconduct.mcmaster.ca/student_code_of_conduct.html