ENGINEERING
McMaster-Mohawk
Bachelor of Technology
Partnership

McMaster
University

Course Outline

1. COURSE INFORMATION

Session Offered	Winter 2024
Course Name	Lean Thinking and Practices
Course Code	GENTECH/SFGNTECH 4LM3
Date(s) and Time(s) of lectures	C01: Wednesday 6:30 pm to 9:30 pm (online)
Program Name	One of the following: Engineering Technology / Energy Engineering Technologies / Manufacturing Engineering Technology/Software Engineering Technology/Civil 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 or eliteengineering2001@gmail.com Office Hours & Location: n/a (online)

2. COURSE SPECIFICS

Course Description	**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.** **GENERAL** **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** **LEAN BUSINESS** **8) Integrated Business Involvement** **9) Lean ERP/Supply Change Management** **PROBLEM SOLVING** **10) Poke yoke** **11) Quick Setup/SMED** **12) FMEA**

13)   Root Cause Analysis

SUSTAINABILITY
14) Total Productive Maintenance (Preventive & Predictive)
15) Reliability Centered Maintenance
Assignments, based on specific chapters out of the required textbooks, will be required to be completed approximately every two (2) weeks. These assignments are based on the philosophies and specific applications of LEAN systems.

Breakout sessions (4), where applicable, are based on specific "Advanced Quality Applications" geared towards "real-life" applications. These are supplements for Problem Solving philosophies for Lean Thinking.

Assignment Due as described in outline.
No Mid-Term
Final Exam (open book)
Two (2) online presentation finals (report due) – refer to dates in this outline.

Instruction Type	Code	Type	Hours per term
	C	Classroom instruction	9
	L	Laboratory, workshop or fieldwork	30
	T	Tutorial	
	DE	Distance education	
		Total Hours	**93**

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**	
		Instructor's notes/Examples; Published Papers/Case Studies, Videos	

Prerequisite(s)	n/a
Corequisite(s)	n/a
Antirequisite(s)	GENTECK 4LT3
Course Specific Policies	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 processer software. **Communication:** 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. The professor will only respond to emails from students' McMaster email accounts.

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	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. **Examinations:** There is no mid-term examination. 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. Students must achieve a cumulative passing mark on the combined project/presentation and final exam assessment to pass the course. However, the student much achieves a minimum of 50%(pass) on each of the project/presentation and final exam components. **Project/Presentation Details** 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). Details of report layout and presentation format is available on "Avenue". **Breakout Session Details (where applicable)** 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) **Group Selection** 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. This must be achieved during the Week of October 2nd. It is the responsibility of the group participants to maintain communication with their team members. Reports and Presentations are due as listed on the deliverables, otherwise specified by the Professor.
Departmental Policies	Students must maintain a GPA of 3.5/12 to continue in the program. 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.

Where group work is indicated in the course outline, such collaborative work is mandatory.

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.

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.

Instructor has the right to submit work to software to identify plagiarism.

3. SUB TOPIC(S)		
Week 1 (Jan 10th)	Lean Introduction (Innovative Manufacturing) • Develop an understanding of the importance of LEAN SYSTEMS for all sectors • Integrate the Lean Thinking philosophies into current environmental concerns	a) Course Introduction, b) Lean Thinking Approach, c) Lean & Green
Week 2 (Jan 17th)	Lean Strategies - Optimizing the Manufacturing Environment through Lean Design and Six Sigma applications and following through with the Visual Factory principles. • 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	Read CH01: The Big Picture a) Lean Design, b) Lean Six Sigma, c) 5S & Visual Controls
Week 3 (Jan 24th)	Lean Strategies - Optimization of the system utilizing Cellular Manufacturing and Value Stream Mapping • 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	Read CH02: Identifying The Value Stream a) Cellular Manufacturing, b) Value Stream Mapping Assignment #1 Due
Week 4 (Jan 31st)	Lean Strategies – Optimizing the environment through Integrated Business Involvement and Supply Chain Management • Distinguish between the traditional approach to maximizing the Supply Chain	Read CH03: Collecting Basic Information About the Current State Read CH04: Documenting

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	• Optimize the involvement of outside parties and stakeholders Integrated Business involvement without oversaturation of the Supply Chain	Manufacturing Process Flow a) Integrated Business Involvement, b) Supply Chain Management
Week 5 (Feb 7th)	Lean Strategies - Optimization utilizing Poke-Yoke and SMED principles • Distinguish between standard mistake-proofing and the Poke-Yoke methodologies • Optimize flow-through utilizing Single Minute Exchange of Dies (SMED) versus traditional changeover procedures	Read CH07: Interpreting & Understanding Basic Product Flow a) Poke-Yoke, b) Quick Setup & SMED Assignment #2 Due Establish Project Teams
Week 6 (Feb 14th)	Continuation of: Lean Strategies - Optimization utilizing Failure Mode Effects Analysis (FMEA) • 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	Read CH08: Utilizing Data In Manufacturing a) Failure Mode Effects Analysis (FMEA) , b) Root Cause Analysis (RCA)
Week 7 (Feb 21st)	*Mid-Term Break*	
Week 8 (Feb 28th)	*Workplace Examples (class discussion)*	
Week 9 (March 6th)	Project Updates • Appraise all of the project updates in terms of Current Value Stream Mapping • Make changes as noted to the Current Value Stream Mapping	
Week 10 (March 13th)	Lean Strategies - Utilizing Total Productive Maintenance (TPM) and Reliability Centered Maintenance (RCM) • 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	a) Total Productive Maintenance (TPM), b) Reliability Centered Maintenance (RCA) Assignment #4 Due Summary of Chapter 7 & 8
Week 11 (March 20th)	Lean Strategies - Utilizing Total Productive Maintenance (TPM) and Reliability Centered Maintenance (RCM)	

	• 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	
Week 12 (March 27th)	Review of outstanding course material and finalizing group onsite work presentations and setup.	Assignment #5 Due Summary of Chapter 10 & 12
Week 13 (April 3rd)	Lean Strategy Presentations (Group Presentations) • Create The Value Stream • Assess the waste • Construct The Value Stream Maps (before and after) Conclude and argue all of the constraints	
Week 14 (April 10th)	Lean Strategy Presentations (Group Presentations) • Create The Value Stream • Assess the waste • Construct The Value Stream Maps (before and after) Conclude and argue all of the constraints	Assignment #6 Due Summary of Chapter 15 & 16
Midterm Recess: Monday, February 19 to Sunday, February 25 Test and Examination Restriction Period: Thursday, April 4 to Thursday, April 11 Classes end: Wednesday, April 10 Final examination period: Friday, April 12 to Thursday, April 25 All examinations MUST be written during the scheduled examination period		

List of experiments

Lab 1	
Lab 2	
Lab 3	
Lab 4	
Lab 5	
Lab 6	
Lab 7	
Lab 8	
Lab 9	
Lab 10	
Lab 11	
Lab 12	

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 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	10%
Mid-term test	n/a
Project	40%
Labs	n/a
Final examination (tests cumulative knowledge)	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. COURSE OUTLINE – APPROVED ADVISORY STATEMENTS

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 expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. It is your responsibility to understand what constitutes academic dishonesty.

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. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/

The following illustrates only three forms of academic dishonesty: The following illustrates only three forms of academic dishonesty:
- plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

AUTHENTICITY / PLAGIARISM DETECTION

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com, please go to www.mcmaster.ca/academicintegrity.

COURSES WITH AN ON-LINE ELEMENT

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

ONLINE PROCTORING

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

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.

CONDUCT EXPECTATIONS

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the Code of Student Rights & Responsibilities (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, whether in person or online.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy.

REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK

McMaster Student Absence Form (MSAF): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests. http://www.mcmaster.ca/policy/Students-AcademicStudies/Studentcode.pdf

COPYRIGHT AND RECORDING

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, including lectures by University instructors

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

EXTREME CIRCUMSTANCES

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.