FLORIDA POLYTECHNIC UNIVERSITY

Course Syllabus

Course Information

Course Number and Title: MAN 3520 Six Sigma
Credit Hours: 3 credits
Current Academic Term: Fall 2020

Instructor Information

Instructor: John Fico
Office: IST 2059
Office Hours: MWF 10:00am-11:00am in-person (in IST-2059), or via Microsoft Teams, and by appointment
Mobile Phone: (414) 429-5646
E-mail: jfico@floridapoly.edu
Class Meeting: T,R 8:00am-9:15am

Course Details

Class delivery mode/meeting times expectations: The course delivery mode is FLEX. Students are expected to attend class during the stated meeting days and times either in the classroom or via Microsoft Teams.

Course Website: https://floridapolytechnic.instructure.com/courses/4641

Official Catalog Course Description:

Strategies, techniques, and tools for process improvement resulting in continuous efforts to achieve stable and predictable results are covered in this class. Application of Six Sigma including managing processes, process improvement and control, and toolset application.

Prerequisites: STA 2023 – Statistics 1
Prerequisite(s) or Co-requisite(s): Not applicable

Communication/Computation Skills Requirement (6A-10.030): No

Required Texts:

Lean Sigma – A Practitioner's Guide 2nd Edition (2016)
by Ian Wedgwood, PhD
ISBN: 978-0133991031 (Referenced in syllabus as "LS" text)

Lean Six Sigma and Minitab:
The Complete Toolbox Guide for Business Improvement" 6th Edition (2020)
by Quentin Brook
ISBN: 978-0995789920 (Referenced in syllabus as "LSSM" text)

Minitab 19 Statistical Software (available to download from Florida Poly software center)

Equipment and Materials:

The format of the course will include lectures by the instructor, class discussions, directed readings, homework, project, and students' presentations.

Course Objectives:

- Understand and be able to apply statistical and managerial aspects of Six Sigma from a practitioner perspective; covering basic and advanced statistical techniques.
- Understand the Define, Measure, Analyze, Improve, Control (DMAIC) Process.
- Understand how to prioritize and manage a Six Sigma project for sustaining process improvements.
- Understanding Key Process Output Variables and Data Types.
- Understand how to create a Value Stream Map.
- Have knowledge of Six Sigma Projects (Case Studies) to illustrate the concepts and methodologies used in Six Sigma.

Course Learning Outcomes:

Upon successfully completing this course, learners will be able to:

1. To develop problem-solving skills for product and process
2. To successfully understand how to use customer driven data to improve a business process
3. How to use data to design a product or process
4. To understand the theories of Six Sigma and be able to apply these theories to achieve a higher quality and greater speed of operations
5. To understand the Six Sigma DMAIC process and tools at a fundamental level.
6. To be able to identify the root-cause of a problem and to improve the quality of process output.
7. To understand how to remove variability in manufacturing and business processes
8. To understand how to use statistical analysis software such as, but not limited to, Minitab software.

Alignment with Program Outcomes:

	Course Learning Outcome							
Business Analytics Program Student Outcomes	1	2	3	4	5	6	7	8
(1) Apply current business analytics concepts, techniques, and practices to solve business problems.	X	X	X	X		X		
(2) Analyze a given business problem using appropriate analytics techniques to generate insights and solutions.	X		X		X	X		
(3) Communicate effectively insights, analysis, conclusions, and solutions to a diverse audience.	X				X	X		

	Course Learning Outcome							
Mechanical Engineering Program Student Outcomes	1	2	3	4	5	6	7	8
1.an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	X	X				X		
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors			X	X				
3. an ability to communicate effectively with a range of audiences	X	X				X		
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts								
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives		X		X	X			
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions		X	X					X
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	X		X					

Academic Support Resources

- **Library**: Students can access the Florida Polytechnic University Library through the University website and Canvas, on and off campus. Students may direct questions to Academic Success Center success@floridapoly.edu or by email, library@floridapoly.edu.
- **ASC**: The Academic Success Center, located in the IST and at ASC East, provides a range of services. Students may direct questions to success@floridapoly.edu.

Course Policies:

- **Attendance**, see also University Policy, which reads "Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as defined by the instructor." Attendance in this environment does not, of course, mean actual physical attendance in the classroom, although it may include that.

Number of missed meetings	Effect on final grade
0 to less than 10 %	No penalty
From 10% up to 15 %	1/2 Letter Grade reduction
From 15 % up to 20 %	1 Letter Grade reduction
From 20% up to 30 %	2 Letter Grade reduction

Grading Scale: (See also University Grading Policy).
Grades will be determined according to the following scale:

> = 93.00	A
90.00 – 92.99	A-
87.00 – 89.99	B+
83.00 – 86.99	B
80.00 – 82.99	B-
75.00 – 79.99	C+
70.00 – 74.99	C
60.00 – 69.99	D
< = 59.99	F

Assignment/Evaluation Methods:

Professionalism and Participation (Attendance)	10%
Out of Class Student Work (Six Sigma Tools)*	37%
Case Studies	12%
Mid-term Exam	15%
Final Exam	15%
Team Project	11%
Total	100%

Participation in all course activities is a very important element of this course, is a basic expectation, and counts for part of your grade. Course participation consists of active and respectful involvement in class discussions, attendance, presentations, peer feedback, postings, replies, projects, and other interactions. The course grade takes into account quality, quantity, and timeliness of student participation. Homework and exams are always graded in a timely manner.

Late Work/Make-up work:
Each student must keep current on assignments. *Late assignments are not accepted, unless permission has been obtained from the instructor in advance*. Medical emergencies with valid documentation would be about the only exception. Any other documentation will be evaluated on a case by case basis.

University Policies

COVID-19 Syllabus Statement
Regardless of the mode of course delivery, all Florida Poly students are asked to make a Campus Commitment demonstrating respect and consideration for themselves or others, and for the people they care about. This Campus Commitment includes monitoring one's health and seeking medical care when appropriate; wearing face-coverings and respecting social-distancing, especially in the classroom and in gatherings; washing one's hands frequently (and when not possible using hand-sanitizer); following medical guidance; and participating in keeping shared spaces clean. If you are experiencing any symptom(s) of COVID-19 outlined by the CDC, you must stay home or in your residence hall room and immediately contact the associate director of campus wellness management at 863-874-8599 or email care@floridapoly.edu.
Basic rules for in the classroom, IST, and Campus:

1. You MUST wear your face covering during class and throughout the building at all times.
2. Absolutely **no eating or drinking** during class.
3. Leave the furniture on its correct floor markings; if the furniture is moved, please return it to those markings.
4. "Take-Two": Whenever possible, clean your space with a sanitizing wipes (take two) before you start and when you are finished with class.
5. Do not remove sanitizing wipes or hand sanitizers from their set locations—they are put there for everyone.
6. Follow directional signs throughout the buildings and respect appropriate social-distancing.
7. Study hard and engage with all of your courses!

Reasonable Accommodations: Florida Polytechnic University is committed to assisting students with disabilities and offering reasonable accommodations to those with documented eligibility. The Office of Disability Services (ODS) coordinates accommodations for students with disabilities in accordance with the ADA Amendments Act of 2008 (ADAAA), the Americans with Disabilities Act of 1990 (ADA), and Section 504 of the Rehabilitation Act of 1973. Reasonable accommodations are determined on an individual basis through an interactive process between you, ODS, and your instructor(s). If you have already registered with ODS, please ensure that you have

requested an accommodation letter for this course and communicate with your instructor about your approved accommodations at your earliest convenience. If you are not registered with ODS but believe you have a temporary health condition or permanent disability requiring an accommodation, please contact ODS as soon as possible.
The Office of Disability Services (ODS):
DisabilityServices@floridapoly.edu
(863)874-8770
ASC East building
ODS website: www.floridapoly.edu > Student Affairs > Health Wellness > Disability Services
Accommodations for Religious Observances, Practices and Beliefs

Title IX: Florida Polytechnic University is committed to ensuring a safe, productive learning environment on our campus that prohibits sex discrimination and sexual misconduct, including sexual harassment, sexual assault, dating violence, domestic violence and stalking. It is important for you to know that there are resources available if you or someone you know needs assistance. You may speak to your professor, but your professors have an obligation to report the incident to the Title IX Coordinator. It is an educational goal that you feel able to share information related to your life experiences in classroom discussions and in one-on-one meetings. However, it is requirement for university employees to share information with the Title IX Coordinator regarding disclosure. However, please know that your information will be kept private to the greatest extent possible. You will not be required to share your experience. If you want to speak to someone who is permitted to keep your disclosure confidential, please seek assistance from the Florida Polytechnic University Ombuds Office, BayCare's Student Assistance Program, 1-800-878-5470 and locally within the community at Peace River Center, 863-413-2707 (24-hour hotline) or 863-413-2708 to schedule an appointment.

Academic Integrity: All students must commit to the highest ethical standards in completion of all academic pursuits and endeavors, whether in classroom or online environments: Academic Integrity

Project

Students will work in groups of three to four for the project. The project will consist of a business scenario where you will assume the role of a Six Sigma Black Belt project team that has been hired by a business manager to solve a customer experience problem. The Six Sigma tools that you are learning will be applied in solving the problem. Rubric will be posted to the course Canvas.

Course Schedule

A tentative course calendar is included below.

Date	*Topic*	*Notes/Assignments*
8/20	The Six Sigma Philosophy Illustrating Six Sigma using LEGO models • Initiate, charter, and manage a Six Sigma project with sustainable results • Establish clear definition of a problem & apply the correct tools to achieve targeted outcome • Develop a rigor in following DMAIC process in problem solving • What if we don't have data? (We need to get it.) • Understanding stakeholder needs & expectations • The value of collaboration **Article 1: What is Six Sigma**? *(Select article doing search on Six Sigma from Florida Poly Library)*	LS text Chapter 1 Assignment: Article 1 Discussion: *What is Six Sigma? (Select article from Florida Poly Library)* · Peer-reviewed · Full text
8/25, 8/27	Implementing Six Sigma-based improvements **Article 2: Where Process-Improvement Projects Go Wrong, by Satya S. Chakravorty (The Wall Street Journal, January 25, 2010)** http://online.wsj.com/news/articles/SB10001424052748703298004574457471313938130	LS text Chapter 2 In class: Form teams for case studies and team project. Assignment: Article 2 Discussion: Summarize article, "*Where Process Improvements Go Wrong".*
9/1, 9/3	Managing Six Sigma Projects in Organizations Introduction to Minitab statistical software Summary of graphical tools • Histograms • Graphical Summary • Pareto Analysis • Time Series Plots	LSSM text Minitab Exercise in class – practicing graphical tools
9/8, 9/10,	Data Types Key Process Output Variables (KPOV) Continuous Data & Attribute Data Summary of graphical tools • Dot Plots • Scatter Plots • Box Plots	LS text Chapters 4 & 5 LS text Chapter 8

	• Fitted Line Plots • p-value – statistical tool	
9/15, 9/17	• Cause-Effect Diagram • Affinity Diagram • Introduction to Hypothesis Testing	LS Text Chapter 8: Assignment: *Pareto Analysis of Courier Logistics*
9/22, 9/24	Introduction to Hypothesis Testing • 1 sample t test • 2 sample t test • Analysis of Variance (ANOVA)	LS Text Chapter 8: Assignment: *Using Hypothesis Testing to Evaluate Purchase Order Processing Times*
9/29, 10/1	Tools for Project Discovery Model Random Variability and Draw Conclusions from Observed Data **Article 3: Process Improvements, Measures and Metrics, The Products of Lean Six Sigma, by Rex Reagan (BPTrends, March 2012)** Case Study 1	LS Text Chapter 8: Assignment-Case Study 1: *1. Using Six Sigma to Improve the Finance Function; Strategic Finance, May 2005* *2. Using Six Sigma to Improve Extrusion Process in Tire Production; Manufacturing Engineering Society International Conference 2017, MESIC 2017, 28-30 June 2017, Vigo (Pontevedra), Spain*
10/1	**Review for Exam**	
10/6	**Midterm Exam**	

10/8	Analysis of Variance (ANOVA) • Study Relationships Between Variables	LS Text Chapter 8 Sections Assignment: *Using ANOVA to Evaluate Commercial Bakery Oven Performance*
10/13, 10/15,	Analysis of Variance (ANOVA) • Monitor and Keep Process Under Control	LS Text Chapter 8 Assignment: Article 3 Discussion: *Process Improvements, Measures and Metrics – The Products of Six Sigma*
10/20, 10/22	Improving Products, Services and Production Processes Measurement System Analysis • Continuous Data	LS Text Chapter 8 Assignment: *Measurement System Analysis at a Steel Producer*
10/27, 10/29	Selected Tool Roadmaps (to be determined) Measurement System Analysis • Attribute Data Regression Analysis - Simple	LS Text Chapter 8 Assignment: *Understanding Process Variables in a Technical Support Call Center Using Simple Regression Analysis*

11/3, 11/5	Regression Analysis - Multiple	LS Text Chapter 8 Assignment: *Understanding Process Variables in a Solar Thermal Energy Test Using Multiple Regression Analysis*
11/10, 11/12	Process capability analysis – Sigma value Control charts • IMR chart • X-bar R Case Study 2	Assignment-Case Study 2: *1. Reducing Welding Defects in Turnaround Projects: A Lean Six Sigma Case Study; Quality Engineering, 26:168–181, 2014 Copyright © Taylor & Francis Group, LLC* *2. Patient Discharge Time Improvement by Using the Six Sigma Approach: A Case Study; Quality Engineering, 25:401–417, 2013 Copyright © Taylor & Francis Group, LLC*
11/17, 11/19 11/24	Control charts • C chart • P chart Presentation of Team Projects (Part 1) Presentation of Team Projects (Part 2)	Assignment: *Determining Process Capability (Sigma Value) and Process Stability in a Theater Operation*

12/1, 12/3	Six Sigma Topics Review	
TBD	**Final Exam**	

The instructor reserves the right to modify this schedule as required by the progression of the class.

Important Dates

September 7	M	Labor Day Holiday - No Classes
November 11	M	Veteran's Day Holiday (Observed) - No Classes
November 25-27	W-F	Thanksgiving Holiday Break - No Classes
November 18	W	Withdrawal Without Academic Penalty Deadline (W assigned)
December 3	Th	Last Day of Classes
December 4-5	F-S	Reading Days - No Classes
December 7-11	M-F	Final Exams
December 16	W	Final Grades Available Online

Sample Rubric for Report and Presentations

The final presentations and reports will be evaluated using the rubrics included below.

Report Rubric

Objective	Category	Below Expectations	Weak	Average	Good	Excellent
	Score	1	2	3	4	5
Students can write professional quality documents	Introduction	Opening is off-topic and inappropriate to the purpose, not concise and no clarity	Opening is somewhat related to the topic and appropriate to the purpose but is not concise and clear	Opening is related to the topic and appropriate to the purpose. Somewhat clear and concise	Opening is related to the topic and appropriate to the purpose. Clear and concise	Strong opening that is clear and concise
	Organization	Disorganized; incorrect format; unclear direction	Somewhat organized; incorrect format; unclear direction	Organized; correct format; unclear direction	Organized; correct format; clear direction	Correct formatting, strong clarity and organization in the development of main points
	Literature Review	Does not present information from any source	Presents information from irrelevant sources representing limited points of view/approaches	Presents information from relevant sources representing limited points of view/approaches	Presents in-depth information from relevant sources representing limited points of view/approaches	Synthesizes in-depth information from relevant sources representing limited points of view/approaches
	Research Design (weighted twice)	Does not provide information on research design	Inquiry design demonstrates misunderstanding of the methodology or theoretical framework	Critical elements of the methodology or theoretical framework are missing, incorrectly developed or unfocused	Critical elements of the methodology or theoretical framework are appropriately developed however, more subtle elements are ignored or unaccounted for	All elements of the methodology or theoretical framework are skillfully developed and may be synthesized from across disciplines or relevant subdisciplines
	Analysis (weighted twice)	Incorrect, Irrelevant, no supporting evidence	Correct, irrelevant, no supporting evidence	Correct, relevant, no supporting evidence	Relevant and correct with supporting evidence	Relevant, correct, complete, incorporates innovative insights
	Next Steps	Missing or content does not support conclusion	Conclusion irrelevant to the findings	Conclusion somewhat relevant to the findings	Conclusion relevant to the findings	Strong conclusion that is clear, complete and compelling
	Grammar & Spelling	Uses language that often impedes meaning due to errors	Uses language that often sometimes meaning due to errors	Uses language that generally conveys meaning to readers with clarity, although writing includes some errors	Uses straightforward language that conveys meaning to readers. Language has few errors	Uses graceful language that communicates meaning to readers with clarity and fluency and is virtually error free
	Reference Style (APA)	Did not follow APA style	Numerous errors in APA style, did not cite sources correctly, formatting issues	Some errors in APA style, cited correctly but formatting issues persist	Minimum errors in style and formatting but does not detract from readability	No errors in APA style
Total points for Report = 50						

Presentation Rubric

Objective	Category	Below Expectations	Weak	Average	Good	Excellent
	Score	1	2	3	4	5
Students can demonstrate mastery of communication technology	Use of Media	Lack of media detracts from the presentation objective	Misuse of media that detracts from the presentation objective	Use of media barely supports and contributes to the presentation objective	Use of media supports and contributes to the presentation objective	Use of media supports, clarifies and reinforces the presentation objective
	Quality of Slides	Very poor quality. Not enough or too much colors, fonts and animations that detract from project objective	Poor quality. Not enough or too much colors, fonts and animations that detract from project objective	Fonts, colors and animations barely support the presentation objective	Fonts, colors and animations support the presentation objective	Fonts, colors and animations support, clarify and reinforce the presentation objective
Students can develop and deliver a compelling oral talk with relevant facts and information	Opening statement	Opening is off-topic and inappropriate to the purpose, not concise and no clarity	Opening is somewhat related to the topic and appropriate to the purpose but is not concise and clear	Opening is related to the topic and appropriate to the purpose. Somewhat clear and concise	Opening is related to the topic and appropriate to the purpose. Clear and concise	Strong opening that is clear and concise
	Organization	Disorganized; incorrect format; unclear direction	Somewhat organized; incorrect format; unclear direction	Organized; correct format; unclear direction	Organized; correct format; clear direction	Correct formatting, strong clarity and organization in the development of main points
	Literature Review	Does not present information from any source	Presents information from irrelevant sources representing limited points of view/approaches	Presents information from relevant sources representing limited points of view/approaches	Presents in-depth information from relevant sources representing limited points of view/approaches	Synthesizes in-depth information from relevant sources representing limited points of view/approaches
	Analysis	Incorrect, Irrelevant, no supporting evidence	Correct, irrelevant, no supporting evidence	Correct, relevant, no supporting evidence	Relevant and correct with supporting evidence	Relevant, correct, complete, incorporates innovative insights
	Next Steps	Missing or content does not support conclusion	Conclusion irrelevant to the findings	Conclusion somewhat relevant to the findings	Conclusion relevant to the findings	Strong conclusion that is clear, complete and compelling
	Timing	Presentation is too short, insufficient coverage of material	Presentation is too long. Unable to cover all the material	Able to cover all the material within five extra minutes	Utilizes allotted time to provide sufficient coverage of material	Well-paced coverage of material within the allotted time
Students can deliver an oral talk with clarity and appropriate poise	Delivery Techniques	Does not participate in the oral presentation	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability of the presentation, and speaker appears uncomfortable.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears tentative.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears comfortable.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and confident.
	Peer Evaluation	5 points				
Total Points = 50						