GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Master of Business Administration, 4th Semester
Subject Class: Functional Elective
Subject Name: World Class Manufacturing (WCM)
Subject Code: 4549285

With effective from academic year 2018-19

1. Learning Outcomes:

Learning Outcome Component	Learning Outcome (Student will be able to)
Business Environment and Domain Knowledge (BEDK)	• *Discuss* best practices adopted by industry in the sphere of WCM.
Critical thinking, Business Analysis, Problem Solving and Innovative Solutions (CBPI)	• *Examine* the barriers to using IT strategically for World Class Manufacturing.
Global Exposure and Cross-Cultural Understanding (GECCU)	• *Discuss* latest trends and developments in technology, systems and practices around the world pertaining to WCM.
Social Responsiveness and Ethics (SRE)	• *Prioritize* the ethical treatment of people, data and resources while developing WCM strategies.
Effective Communication (EC)	• *Identify* communications tools, techniques and methodologies that can be used in gathering inputs for implementing a specific WCM system.
Leadership and Teamwork (LT)	• *Compare* and *contrast* team building practices to implement the World Class Manufacturing Plan across an organization in different industry.

LO – PO Mapping: Correlation Levels:
1 = Slight (Low); 2 = Moderate (Medium); 3 = Substantial (High), "-"= no correlation

Sub. Code: 4549285	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
LO1: *Discuss* best practices adopted by industry in the sphere of WCM.	3	3	1	3	2	1	-	-	1
LO2: *Examine* the barriers to using IT strategically for World Class Manufacturing.	2	3	2	2	1	1	-	1	-
LO3: *Discuss* latest trends and developments in technology, systems and practices around the world pertaining to WCM.	2	3	1	1	3	1	1	2	-
LO4: *Prioritize* the ethical treatment of people, data and resources while developing WCM strategies.	2	-	-	1	-	1	3	-	1
LO5: *Identify* communications tools, techniques and methodologies that can be used in gathering inputs for implementing a specific WCM system.	3	2	1	3	-	1	1	1	1
LO6: *Compare* and *contrast* team building practices to implement the World Class Manufacturing Plan across an organization in different industry.	1	3	2	3	-	3	-	3	1

2. **Course Duration:** The course duration is of **40 sessions of 60 minutes each.**

3. **Course Contents:**

Module No:	Module Content	No. of Sessions	70 Marks (External Evaluation)

I	**Philosophy of World Class Manufacturing:**
	• Evolution of WCM
	  ○ Taiichi Ohno and Shigeo Shingo
	  ○ Richard Schonberger
	  ▪ Manufacturing assessment using customer focused principles
	  ○ Toyota Production System (TPS) (briefly)
	  ▪ Genesis and development
	  ▪ Influence of Henry Ford, Taiichi Ohno, Eiji Toyoda, and Shigeo Shingo.
	  ▪ *Muri, mura, muda*
	  ▪ Conceptual pillars
	  • Just-in-Time
	  • *Jidoka (Autonomation)*
	  ▪ Underlying principles of TPS
	  • Continuous improvement
	  ○ Challenge
	  ○ Kaizen
	  ○ Gemba and Genchi Genbutsu
	  • Respect for People
	  ▪ Key tools and concepts within TPS
	  • Kaizen
	  • Kanban
	  • Poka-yoke
	  • 5S
	  • Value Stream Mapping (VSM)
	  ○ WCM model (temple) developed by FIAT and contributions of Hajime Yamashina.
	  ▪ Ten technical pillars
	  ▪ Ten managerial pillars
	  ▪ Difference between FIAT's WCM and Schonberger's WCM
	• Gaining competitive edge through world class manufacturing
		10	18

II	**Contemporary Practices (basic introduction):** • TOPP • AMBITE System • MRP II • Automated Production Systems ○ Fixed Automation Systems	10	18

	○ Flexible Automation Systems (FAS) ○ Programmable Automation Systems • Service automation **Human Resource Management in WCM**: • Adding value to the organization • Organizational learning, Cross functional teams • People as problem solvers • Total Employee involvement • Human Integration movement • Motivation and reward in the age of continuous improvement.		
III	**Lean Production:** • Concept and core idea • Seven Deadly Wastes • Key tools ○ 5S ○ *Andon* (Visual Feedback) ○ Visual Factory ○ Bottleneck analysis ○ SMED (Single Minute Exchange of Dies) **Agile Manufacturing:** • Concept, Lean as a precursor to Agile • Effectiveness of Agile • Key elements of Agile ○ Modular Product Design ○ Information Technology ○ Corporate Partners ○ Knowledge Culture **Short Interval Control:** • Concept, key features and elements, benefits **Hoshin Kanri (Policy Deployment):** • Concept, core principles	10	17
IV	**Six Sigma:** • Value of Six Sigma • Design for Six Sigma (DFSS) ○ DMAIC, IDOV, FMEA, DMADV • <u>DMAIC (in brief)</u> • Define Phase ○ Create Project Charter, Process mapping, identifying customers, translating customer requirements. ○ Commonly used tools – Force field analysis, Risk Priority Number (RPN), SIPOC Diagram. • Measure Phase ○ Process measurement, AS IS Value Stream Map, Process inputs and outputs ○ Preparing data collection plan, assessing process	10	17

	capabilities (process capability and performance indices) o Process performance v/s specification. • Analyze Phase o Identify critical inputs, data analysis, and process analysis, determining and prioritizing root causes. (This is done through various statistical tests. It is not required to perform any numerical analysis. Students should be just apprised of the significance of statistical testing during this phase). • Improve Phase o Priority list of solutions, applying lean Six Sigma best practices, creating TO BE value stream map, risk assessment, pilot testing of solution. • Control Phase: o Creating the process control plan, developing Standard Operating Procedures (SOPs), training, transition of ownership, project storyboard.		
V	**Practical:** • Use case studies of world class manufacturing companies. • Students can simulate process improvements in their surroundings. Students can also carry out projects in organizations which have implemented Six Sigma. • Students can also undertake Kaizen and 5S projects in small SMEs or service organizations.	---	(30 marks CEC)

4. Pedagogy:

- ICT enabled Classroom teaching
- Case study
- Practical / live assignment
- Interactive class room discussions

5. Evaluation:

Students shall be evaluated on the following components:

A	**Internal Evaluation**	**(Internal Assessment- 50 Marks)**
	• Continuous Evaluation Component	30 marks
	• Class Presence & Participation	10 marks
	• Quiz	10 marks
B	**Mid-Semester examination**	**(Internal Assessment-30 Marks)**
C	**End –Semester Examination**	**(External Assessment-70 Marks)**

6. Reference Books:

No.	Author	Name of the Book	Publisher	Year of Publication / Edition
1	B.S. Sahay, K B C Saxena, Ashish Kumar	World Class Manufacturing - Strategic Perspective	Laxmi	2018 / 1st
2	Jeffrey Liker	The Toyota Way	McGraw Hill	2017 / 1st
3	Richard J. Schonberger	World Class Manufacturing: The Next Decade: Building Power, Strength, and Value	Free Press	2013
4	Stephen Haag, Paige Baltzan, Amy Phillips	Business Driven Technology	McGraw Hill	2019 / 8th
5	Ron Moore	Making Common Sense Common Practice	Butterworth-Heinemann	2013 / 4th
6	Adeel Hejaaji	World Class Manufacturing	Lambert	2015
7	James M. Morgan, Jeffrey Liker	Designing the Future	McGraw Hill	2019 / 1st
8	Phillip Ledbetter	The Toyota Template: The Plan for Just-In-Time and Culture Change Beyond Lean Tools	Productivity Press	2018 / 1st
9	Edward H. Frazelle	World Class Manufacturing and Material Handling	McGraw Hill	2016 / 2nd
10	P. James Womack, T. Daniel Jones, Daniel Roos	The Machine That Changed the World	Simon & Schuste	2007
11	Mikell P. Groover	Automation, Production Systems, and Computer-Integrated Manufacturing	Pearson	2016 / 4th
12	Roderick A. Munro, Govindarajan Ramu and Daniel J. Zrymiak	The Certified Six Sigma Green Belt Handbook, Second Edition	ASQ Quality Press	2015
13	Michael L.George, David Rownalds, Bill Kastle	What is Lean Six Sigma?	McGraw Hill	2003

Note: Wherever the standard books are not available for the topic appropriate print and online resources, journals and books published by different authors may be prescribed.

7. List of Journals/Periodicals/Magazines/Newspapers / Web resources, etc.

1. International Journal of Production Research
2. Lean & Six Sigma Review
3. International Journal of Six Sigma and Competitive Advantage
4. International Journal of Lean Six Sigma
5. https://world-class-manufacturing.com/
6. http://www.opentextbooks.org.hk/ditatopic/18770
7. https://better-operations.com/2013/05/22/world-class-manufacturing-at-chrysler-and-fiat/
8. https://www.leanproduction.com/