FIRST SEMESTER 2015-16

Course Handout (Part II)

Date: 03/08/2015

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : **ME G538**
Course title : **Toyota Production System**
Instructor-in-charge : **RAJESH P MISHRA**

Course description

Scope
Objectives

- Opportunity to see Toyota at close
- To provide a clear and simple guide to lean manufacturing / Toyota production system
- Provides a great way to begin learning and opportunity for you to start your own journey (The Toyota Way)
- At the end of this course, the students will be able to understand the importance of lean manufacturing / The Toyota Way as a strategic weapon
- At the end of this course, the student will be able to understand the World –Class power of the Toyota way

Text books

T1. Pascal Dennis, "Lean Production Simplified", 2nd Edition, Productivity Press, 2007.
T2. John Nicholas, “Lean Production for Competitive Advantage” CRC Press New Yark

Reference books

R1. Masaaki Imai, “Gemba Kaizen: A Commonsense, Low-Cost Approach to Management”, MaGraw-Hill, 1997.
R2. Jeffrey K. Liker, “The Toyota Way”, MaGraw-Hill Edition, New Delhi, 2004.
R3. James P. Womack and Daniel T. Jones, “Lean Thinking: Banish Waste & Create Wealth in Your Corporation, Revised Edition, Simon & Shuster, 2001.
R4. Mike Rother, “Learning to See: Value Stream Mapping to Create Value & Eliminate MUDA”, Lean Enterprise Institute, 2003.
R5. John Allen, Charles Robinson and David Stewart, “Lean Manufacturing: A Plant Floor Guide”, Society of Manufacturing Engineers, Michigan, 2001.
R6. Mike Rother, “Toyota Kata: Managing People for Improvement, Adaptiveness, and Superior Results”, Tata MaGraw-Hill Edition, 2010.

Course plan

Lecture Number	Topics to be covered and Learning objectives	Refer to Chapter, (Book)
1	Introduction	
2-15	**Race without a Finish Line** Birth of lean production, Lean production system, Stability, Standardized work, Just-In-Time, Jidoka, Involvement, Hoshin planning, The culture Competitive Advantage: Better, Cheaper, Faster, More Agile, Lean Production and Total Quality Management, Lean Production and the Production Pipeline, The Lean Difference, The Machine That Changed the World, Craftsmanship Yields to Industrialization, Craft Production of Automobiles, Ford's Mass Production System, Emergence of Modern Mass Production, Mass Production around the World, Toyota Production System—Prototype for Lean Production etc	T1 T2
16	**Fundamentals of Continuous Improvement** Continuous Improvement as Tactics and Strategy, Finding and Implementing Improvements.., PDCA Cycle, Five-Why Process, Value Analysis/Value Engineering, Reengineering Fundamentals, Employee-Driven Kaizen, Kaizen Projects, Basic Problem-Solving and Improvement Tools etc..	T2
17-18	**Value Added and Waste Elimination** Value-Added Focus, Necessary and Unnecessary Activities , Support Organization , Employee Involvement, Sources of Waste , Toyota's Seven Wastes , Canon's Nine Wastes ,Lean to Green , Lean Principles, Simplification, Product, Process, and Procedure Simplification, Concurrent Engineering, Cleanliness and Organization, Agility, Measurement, Grass Roots Measurement, Visual Management: Information Post-Its, Getting to the Bottom Line, Variation Reduction , Lean Principles beyond Manufacturing , The Meaning of Lean Production, Implementation Barriers, Attitudes, Time Commitment, Quality Commitment, Misunderstanding Lean Production, Social Impact of Lean, First Things First	T2
19-20	**Customer-Focused Quality** Quality Defined, Customer's Perspective, Producer's Perspective, Quality of Design, Quality of Conformance, Total Quality Management, TQM Integrative Framework, Marketing, Sales, and Finance, Product Design and Manufacturing Design, Purchasing and Suppliers, Production Management and Frontline Workers, Customer Service, Six Sigma, Statistical Interpretation, DMAIC Improvement Process, Belts and Certification, Statistical Process Control (SPC), Control Chart, Process Stability, Process Capability, Nonstatistical Process Control, Employee Involvement and Quality Ownership, Frontline Worker Responsibility, Process Orientation, Quality Training and Education, Implementing TQM, Barriers to Successful TQM, TQM and Lean Production	T2
21-22	**Small Lot Production** Lot Size Basics, Lot Sizing and Setup Reduction, Kind of Lots, Process and Purchase Batches, Period Order Quantity, Economic Manufacturing Quantity, EOQ-Based Methods: Discussion, Lot Size Reduction, Effect of Lot Size Reduction of Competitive Criteria, Lead Time, Carrying Cost, Setup and Handling Cost, Quality, Flexibility Case for Larger Process Batches, Minimal Lot Size, Small Buffer Stock, Demand Variability, Lead Time Variability, Facilitating Small Lot Sizes, Process Batches, Purchase Quantities, Transfer Batches, Delivery and Shipping, atches	T2
23-24	**Setup-Time Reduction** Traditional Approaches, Benefits of Simplified Setups, SMED Methodology for Setup Reduction, Techniques for Setup Reduction	**T2**
25-26	**Maintaining and Improving Equipment** Equipment Maintenance, Breakdown Repair, Equipment Problems and Competitiveness, Preventive Maintenance, Total Productive Maintenance, Maintainability, Reliability, Failure Pattern, Mean Time between Failure, Availability, Repair Downtime Variability, Efficiency, Overall Equipment Effectiveness, Ways of Scheduling PM Scheduled PM and Failure Pattern, Use Predictive Maintenance, Role of Operators, Total Productive Maintenance, Foolproofing, Improving Maintenance Procedures, Implementing TPM, Maintenance Organization	T2
27-28	**Pull Production Systems**	

Lecture Number	Topics to be covered and Learning objectives	Refer to Chapter, (Book)
	Production Control Systems, Pull Systems and Push Systems, Pull Production Process, Why Pull Production Cannot Be Stockless, Push Production Process, Pull Production and Push Production Contrasted, Rules for Pull Production, How to Achieve Pull Production, Outbound and Inbound Buffers, Conveyance Kanbans, Production Kanbans, Safety Factor, Another Single-Card System, Signal Kanban, Other Mechanisms for Signal and Control, Necessary Conditions for Pull Production, Pull Production and Repetitive Production, When Pull Does Not Work, Pull and Push Systems, Both at Once	T2
29-30	**Focused Factories and Group Technology** Ways of Doing Work, Variety—Efficiency Tradeoff, Facilities Layout, Variety-Volume Tradeoff, Group Technology : GT and Product Design, Flexible U-Lines and S-Lines, Coding and Classification, Cluster Analysis, Production Flow Analysis, Binary Ordering Algorithm	T2
31-32	**Workcells and Cellular Manufacturing** Workcell Concepts, Workstations, Workers, and Machines, Workcell Output and Number of Workers, Workcell Applications, Typical Workcell End Items, Linked Workcells and Subcells, Workcell Design, Workcells Beyond Manufacturing, Cell Automation, Implementing Cellular Manufacturing	T2
33-34	**Standard Operations** Standard Operations, Shop-Floor Relevancy, Shop-Floor Involvement , TaktTime, Standard Operations Routine, Operations Routine and Process Routing Sequence, Idle Time, Improvement Tool, Conditions for Successful Standard Operations, Standard Operations in the Service Sector	T2
35-36	**Quality at the Source and Mistake-Proofing** SPC Limitations , % Inspection (Screening), Requirements for Self-Checks and Successive Checks, Consideration and Support for Workers, Pursuit of Perfection: Limits of Inspection, Jidoka, Autonomation, Andons, Source Inspection and Pokayoke, Continuous Improvement	T2
37-40	**Uniform Flow and Mixed-Model Scheduling** Production Leveling , Continuous, Stable Demand, Short Setup Times, Level Scheduling in Pull Production, Mixed-Model Production, Heijunka: Mixed-Model Production, Elimination of Losses Due to Line Changeover, Process Improvement, Production Philosophy, Final Assembly Scheduling versus Master Production Scheduling, MTS: Uniform Load Production Schedule, Alternative to Planning Bills, Role of Concurrent Engineering, Minimizing Scheduling Problems, Hybrid Systems	T2
41-45	**Synchronizing and Balancing the Process** Synchronization , Synchronized Cycle Times, The Essence of Cycle Time, Bottleneck Scheduling, Drum-Buffer-Rope : Pull from Bottleneck, Other Ways to Achieve Balance, Dynamic Balance, Balancing for Synchronous Flow Balancing through Worker Reassignment, Maintaining Synchronization, Adapting to Schedule Changes, Alter the Production Workday, Alter the Production Rate (Adjust Cycle Time)	T2

Evaluation scheme

No.	Evaluation Component	Duration	Weightage	Date & Time	Nature of the Component
1	Mid semester Test	90 Min	25%	6/10 10:00 - 11:30 AM	Closed Book
3	Comp Exam.	3 Hrs	35%	3/12 AN	Partially Open Book
4	Assignment/Project		40%		Take home

Chamber consultation hour:

Notices: All notices regarding the course will be displayed only on the **Mechanical Engineering Group** notice board.

Instructor In-charge