LEAN SYSTEMS AND PRACTICES	
Course Code: ASOE01	**Credits: 3:0:0**
Prerequisite:	**Contact Hours: 45L**
Course Coordinator: Dr. Anand M Raikar	

Course Content

Unit I

Introduction to Lean Management practices: Introduction to Lean Manufacturing, Lean philosophy, principles of Lean, evolution of continuous improvement. Identification of different types of waste- MUDA, MURA and MURI.

Value added approach and House Keeping Concepts: Value added and non-value approach, Just in time concept and Kaizen approach. 5S housekeeping Concepts, 5S auditing, advantages.

- Pedagogy/Course delivery tools: PPT presentations, classroom teaching, industrial case studies, practical exercises and Lecture from Industry expert.

Unit II

Evolution of Manufacturing Systems and Lean Operations: History of craftsmanship, traditional manufacturing systems, challenges in craft production, evolution of mass manufacturing, interchangeable parts, assembly line concepts, Ford Production System, Toyota Production System, Lean manufacturing philosophy. Concept of Push and Pull system, advantages and limitations. Production Control Systems, Process Improvement, How to Achieve Pull Production

- Pedagogy/Course delivery tools: PPT presentations, classroom teaching, industrial case studies and practical exercises.

Unit III

Elements of Lean Production: Small-Lot Production, Lot-Size Basics, Lot Sizing, Lot- Size Reduction, Facilitating small Lot Sizes. Case studies.

Setup-Time Reduction: Improve Setups. Setup-Reduction Methodology, Techniques for Setup Reduction, setup-Reduction Projects. Case studies. (Problems to be discussed)

- Pedagogy/Course delivery tools: PPT presentations, classroom teaching, industrial case studies and practical exercises.

UNIT IV

Future Factories and Work cell concepts: Facilities Layout, Group Technology, Focused Factory. Concept of Takt time and calculations and workload balancing concept

Work cells and Cellular Manufacturing: Work cell Concepts, Work cell Applications, Work Design, and Workers in Cells, Equipment Issues, Implementing, and Getting Started. Case studies. (Problems to be discussed)

- Pedagogy/Course delivery tools: PPT presentations, classroom teaching, industrial case studies, software demonstrations, business process mapping exercises and practical assignments.

Unit V

Lean Systems: Introduction to value stream mapping, VSM Principles, VSM tools, Concept of VMapQ.

Lean systems in Information Technology (Lean IT): Introduction to Lean IT, importance of Lean IT in digital enterprises, business–IT alignment, Lean principles applied to information systems, information as a value stream, information value and information waste, types of information waste, Business Process Management (BPM), Lean IT demand management, flow and pull concepts in information systems, Lean management systems, knowledge management and collaboration, IT Service Management (ITIL), Lean software development, Lean project management, cloud computing, digital transformation, Lean IT implementation roadmap and industrial applications of Lean IT in manufacturing and service organizations.

- Pedagogy/Course delivery tools: PPT presentations, classroom teaching, industrial case studies and practical exercises.

Text Books:

1. The Toyota Way, Jeffrey K. Liker, 2nd Edition, McGraw-Hill Education, 2021.
2. Lean Thinking: Banish Waste and Create Wealth in Your Corporation, James P. Womack and Daniel T. Jones, Revised Edition, Simon & Schuster, 2003.
3. Learning to See: Value Stream Mapping to Add Value and Eliminate MUDA, Mike Rother and John Shook, Lean Enterprise Institute, 2009.
4. Lean IT: Enabling and Sustaining Your Lean Transformation, Steven C. Bell and Michael A. Orzen, Productivity Press, 2011.

Reference Books:

1. The Machine That Changed the World, James P. Womack, Daniel T. Jones and Daniel Roos, Simon & Schuster, 2007.
2. Lean Production Simplified, Pascal Dennis, CRC Press, 2017.
3. Creating a Lean Culture, David Mann, CRC Press, 2022.
4. Lean Software Development: An Agile Toolkit, Mary Poppendieck and Tom Poppendieck, Addison-Wesley, 2003.
5. Lean Six Sigma for Service, Michael L. George, McGraw-Hill, 2003.

Course Outcomes (COs):

CO1: Explain the core philosophy and principles of Lean manufacturing, and identify the types of waste (Muda, Mura, Muri) present in a production system (PO-1, PO-2, PO-6)

CO2: Trace the evolution of manufacturing systems from craft production to the Toyota Production System, and differentiate between push and pull-based production control (PO-1, PO-2, PO-6)

CO3: Apply small-lot production and setup-time reduction techniques to improve manufacturing efficiency in real-world case scenarios (PO-2, PO-3, PO-4)

CO4: Design work cells and cellular manufacturing layouts using Group Technology and Takt time calculations to balance workloads on the shop floor (PO-3, PO-5, PO-8)

CO5: Construct value stream maps to analyze information and material flow, and apply Lean IT principles to improve business processes in digital enterprises (PO-3, PO-5, PO-9, PO-11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	**Marks**	**Course outcomes addressed**
Internal Test-I	30	CO1 & CO2
Internal Test-II	30	CO3, CO4 & CO5
Average of the two internal tests will be considered for evaluation of 30 Marks		
Other components-20 Marks		
Assignment	10	CO1 to CO5
Quiz	10	CO1 to CO5
Semester End Examination (SEE):100 Marks		
Semester End Examination (SEE):	100 Marks	CO1 to CO5